ELECTRICAL TIMES

THURSDAY
18 DEC. 1952
NINEPENCE

DUNSTON B POWER STATION, B.E.A. NORTH EASTERN DIVISION

Consulting Engineers: Merz & McLellan

Thirteen of the Twenty

Dunston B II, which heads the B.E.A. list of twenty power stations in Great Britain showing the highest overall thermal efficiencies in 1951, with a figure of 29.39% for the year, is equipped with BABCOCK Boilers; as is Battersea B which topped the list for 1950. Of these twenty highest efficiency stations of 1951, *thirteen* have boilers made by the Babcock organisation.

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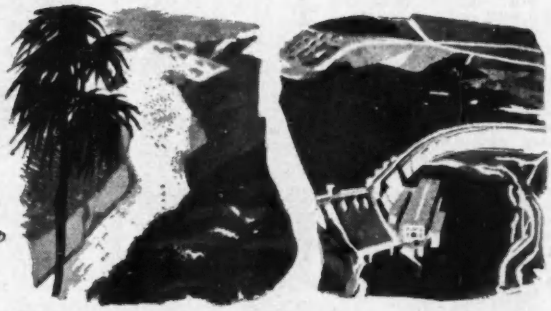
Aluminium conductor spans the world

Nations that have traditionally been regarded as agricultural are now turning to the manufacture, not only of foodstuffs, but of consumer goods of all types for their growing populations and in some cases for export. New industries and the modernization of agricultural methods demand increased supplies of electric power and its means of economic distribution from hydro electric sources, whose location is determined by the physical features of the area, to the centres of population.

New Zealand

Source of Dairy Produce and of Mutton is creating flourishing consumer industries dependent on cheap and readily available electricity.



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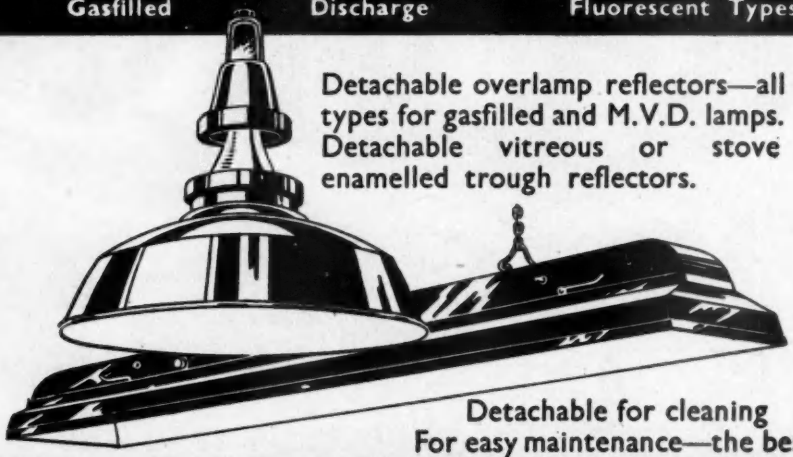
THORLUX INDUSTRIAL LIGHTING EQUIPMENT. Manufacturers of Gasfilled Discharge Fluorescent Types



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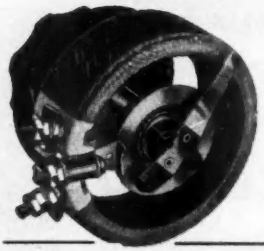

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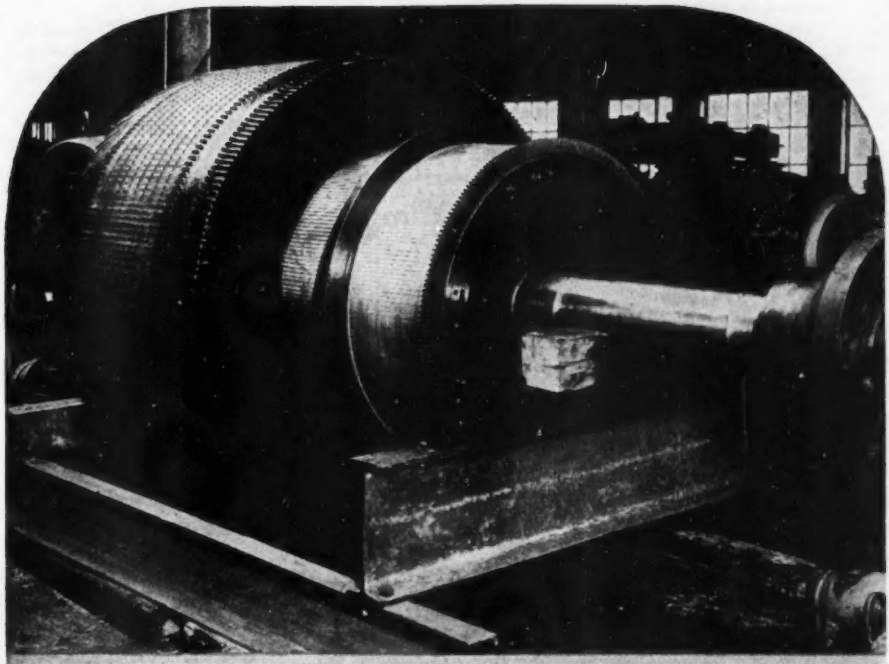

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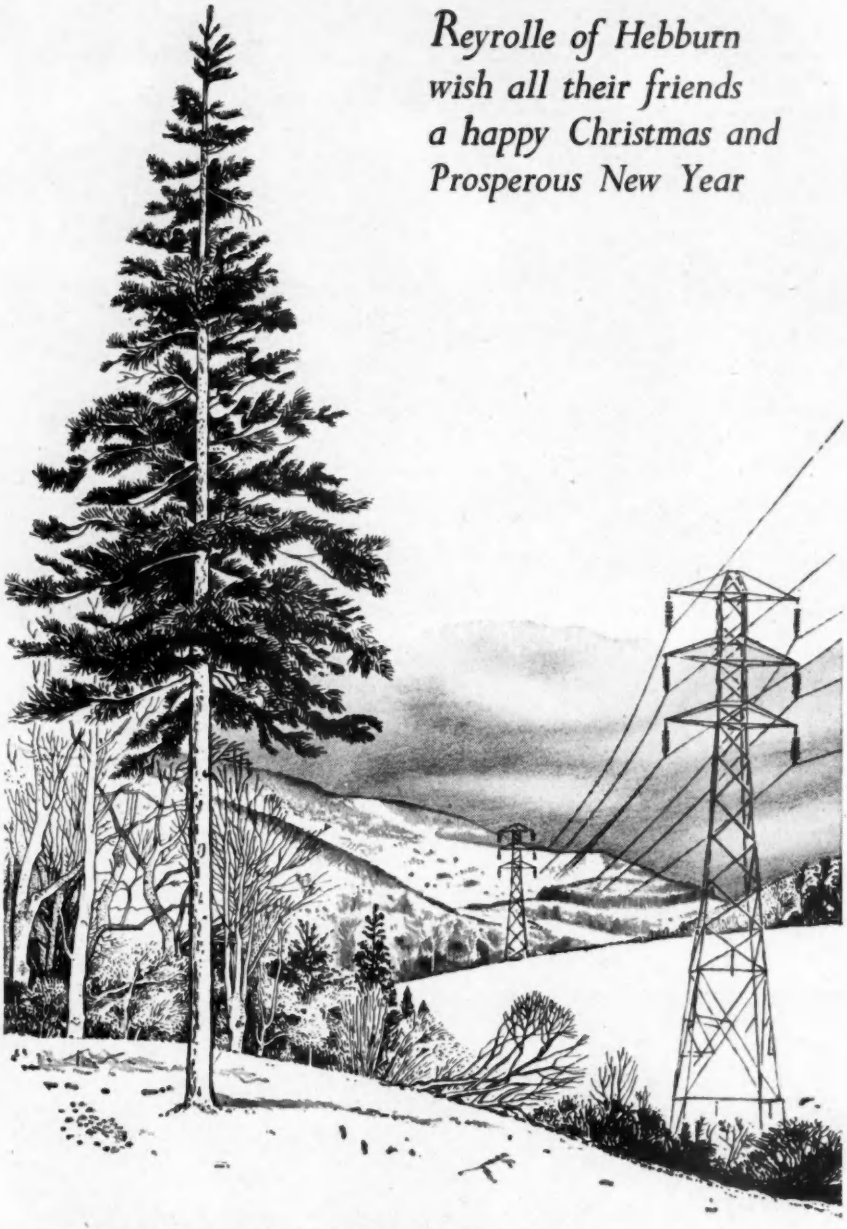
a happy Christmas and
Prosperous New Year



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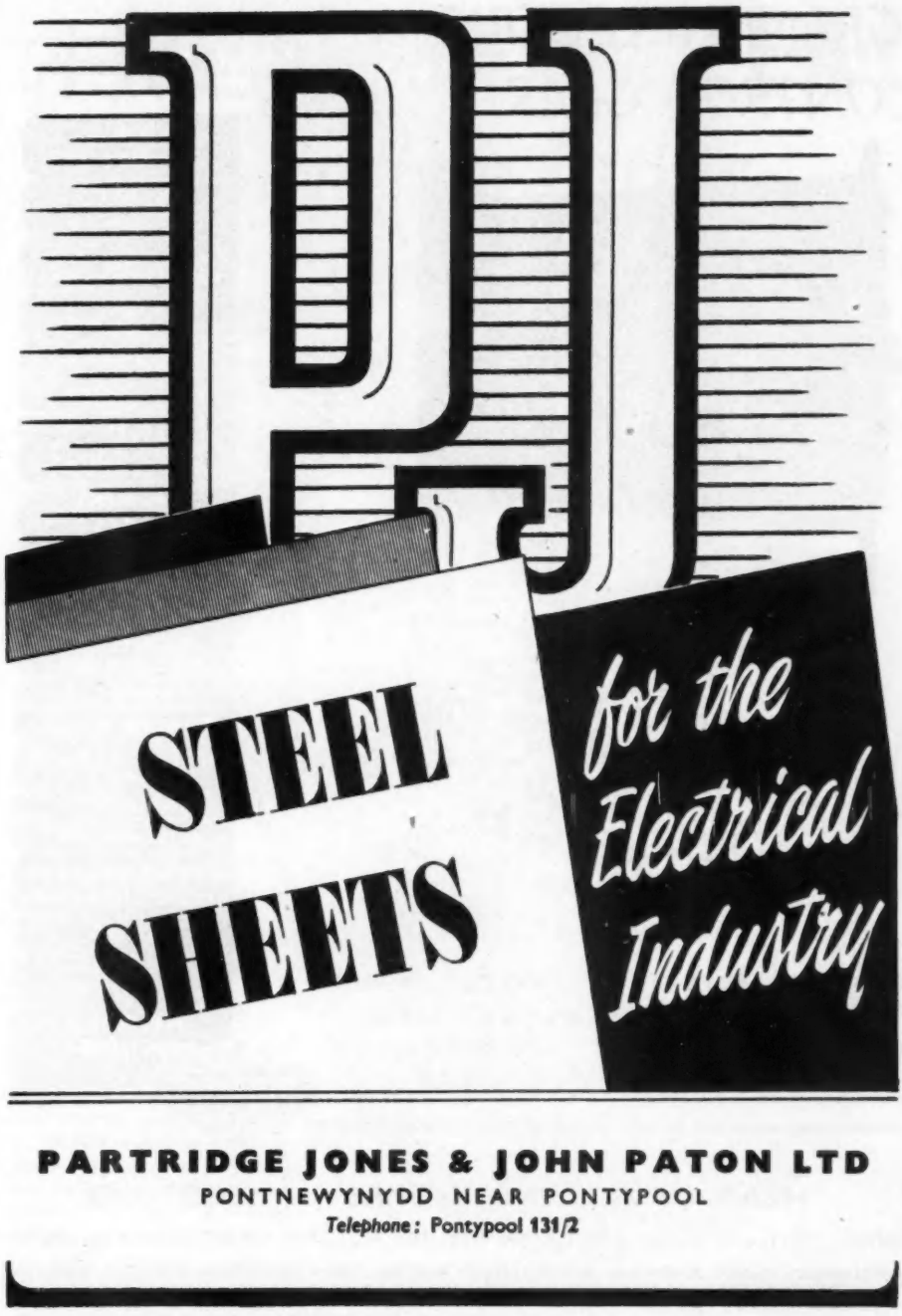

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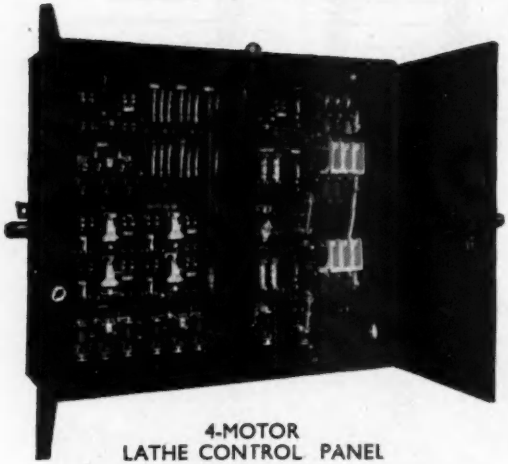

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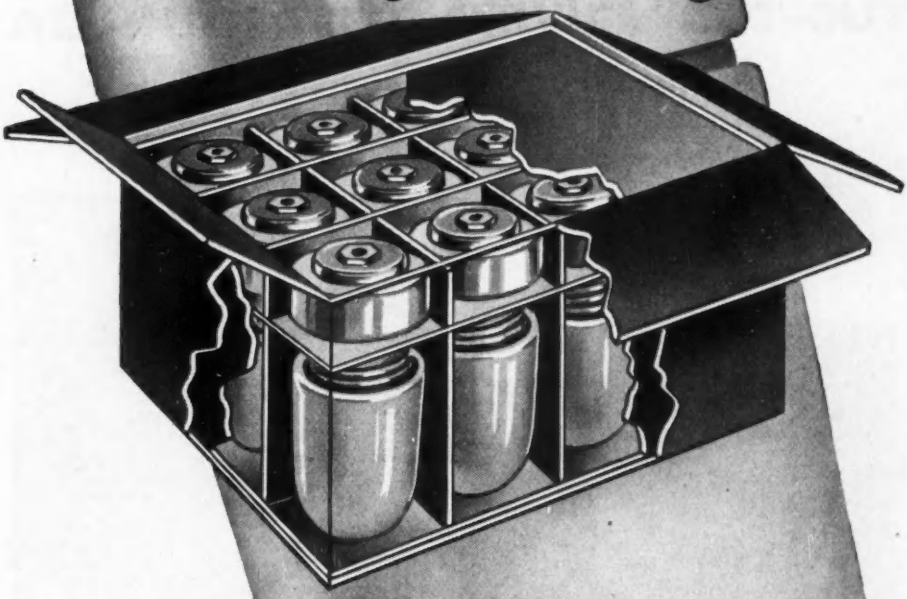

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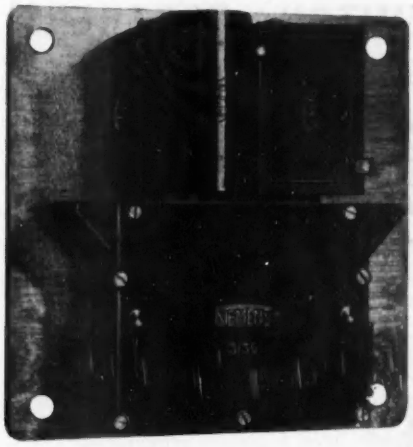

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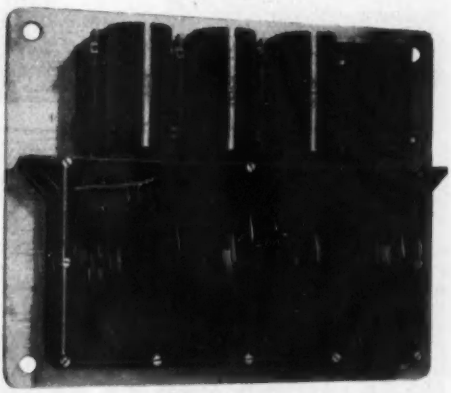
Sealing Chambers
For maximum cable size 0·15 sq. in.

Designed for Type R.F. ENGLISH ELECTRIC H.R.C. Fuse Links Category of Duty 440 A.C.4



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These cut-outs consist of substantially moulded units and are especially suitable for Industrial Services and for large blocks of Flats, Office Buildings, etc.

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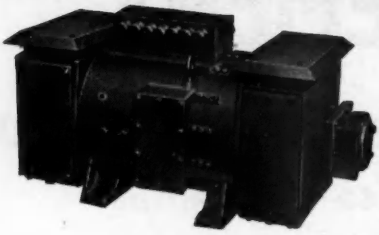

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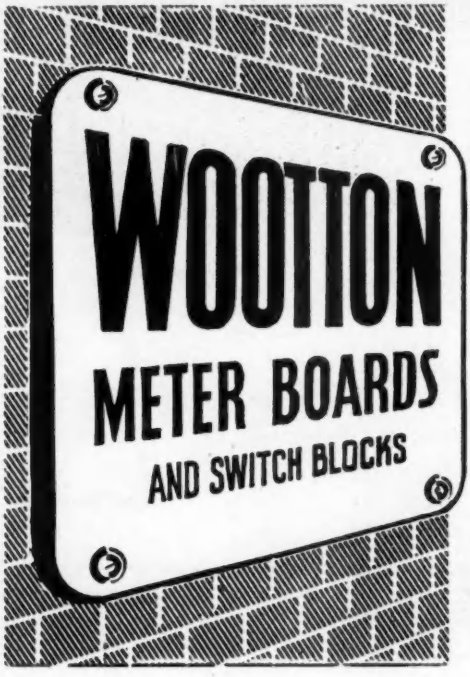

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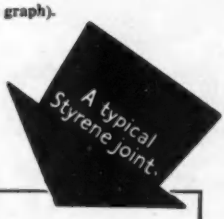

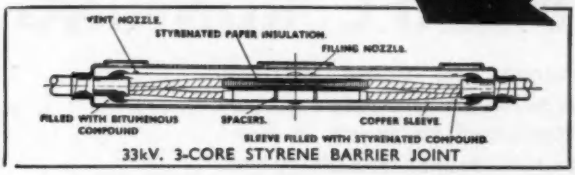

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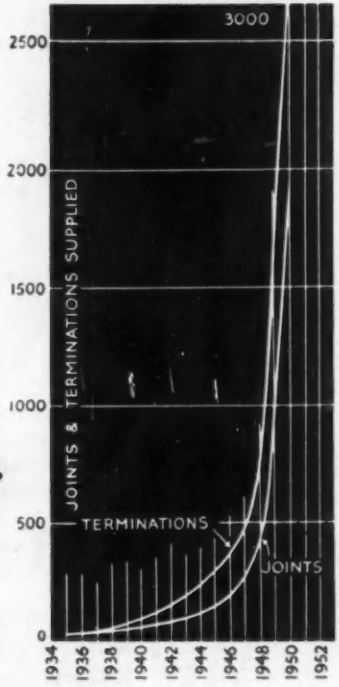

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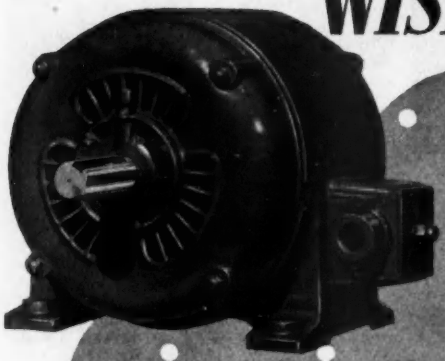

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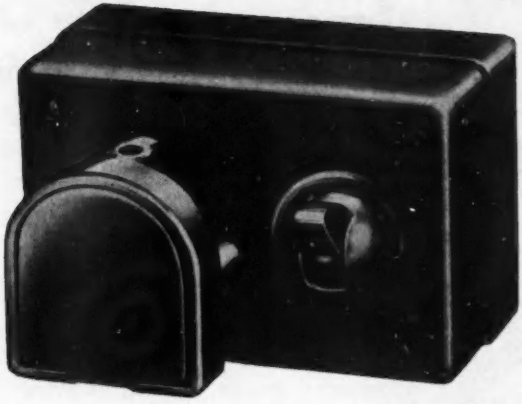

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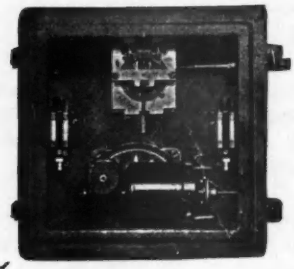

- Suitable for large A.C. or D.C. machines.
- Possesses extreme sensitivity.
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- Full balancing gives stability under mobile conditions.
- Simple to install and to put into operation.
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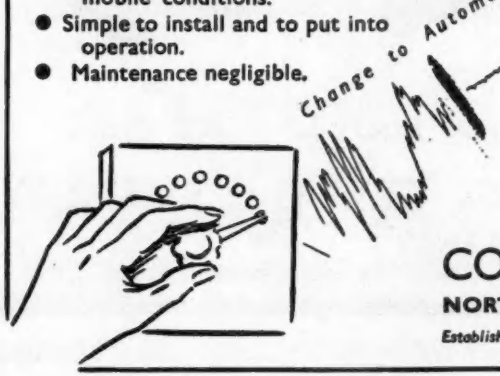

As specialists in the field we shall be pleased to advise on the question of automatic voltage regulation if we may receive particulars of your specific requirements for any loading.

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Model 8

UNIVERSAL AVOMETER

20,000 ohms per volt *plus* AUTOMATIC Overload Protection

Produced in response to a demand for a **high sensitivity** version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability. It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100 V upwards. A decibel scale is provided for audio frequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials both positive and negative about a common reference point.

A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.

Sizes: 8¼in. × 7¼in. × 4½in.
Weight: 6½ lbs. (including leads).

£23 : 10s.

The following accessories are available to widen still further the ranges of the instrument: A Resistance Range Extension Unit to extend the limits of measurement from 0.025 ohms to 200MΩ, a 10 kV D.C. multiplier and a number of A.C. current transformers.

D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2.5 V	50μA	2.5 V	100 mA	First indication 0.5Ω
10 V	250μA	10 V	1 A	Maximum indication 20 MΩ
25 V	1 mA	25 V	2.5 A	0-2,000Ω — using internal batteries
100 V	10 mA	100 V	10 A	0-200,000Ω — using internal batteries
250 V	100 mA	250 V		0-20 MΩ — using internal batteries
1,000 V	1 A	1,000 V		using external batteries
2,500 V	10 A	2,500 V		0-200 MΩ — using external batteries

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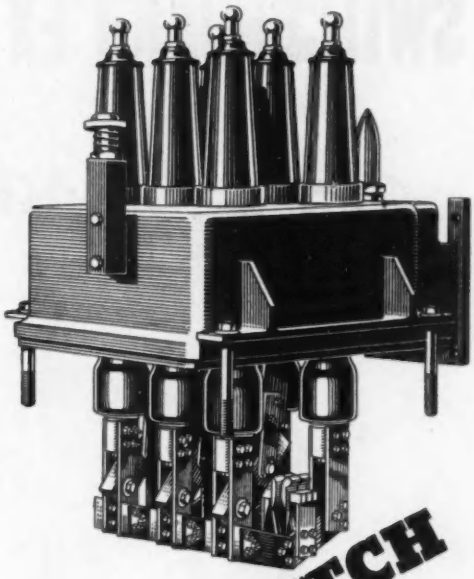
AB/1

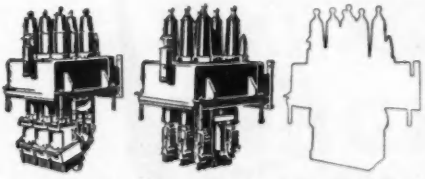
THE Trinal non-automatic oil switch has been tested to B.S. 116/1937 at a current of 800 amperes, with additional making tests at 250 MVA, 6,600 volts. Its general construction provides ample strength to withstand heavy through faults without sustaining damage. By ingenious design the short-circuit "throw-off" force, which causes trouble in many designs by repulsing the moving contact, assists the closing force and so safeguards the operator should the switch be closed on to a fault.



J. & P. TRINAL OIL SWITCH

ONE OF THE J. & P. TRINAL RANGE

The Trinal oil switch can be mounted on a simple framework to make a very economical unit. This unit is identical in width to J. & P. vertical isolation gear which can be easily substituted should system growth make it necessary.



The TRINAL Arc-control Breaker *The TRINAL Plain-break Breaker* *The TRINAL Oil Switch*

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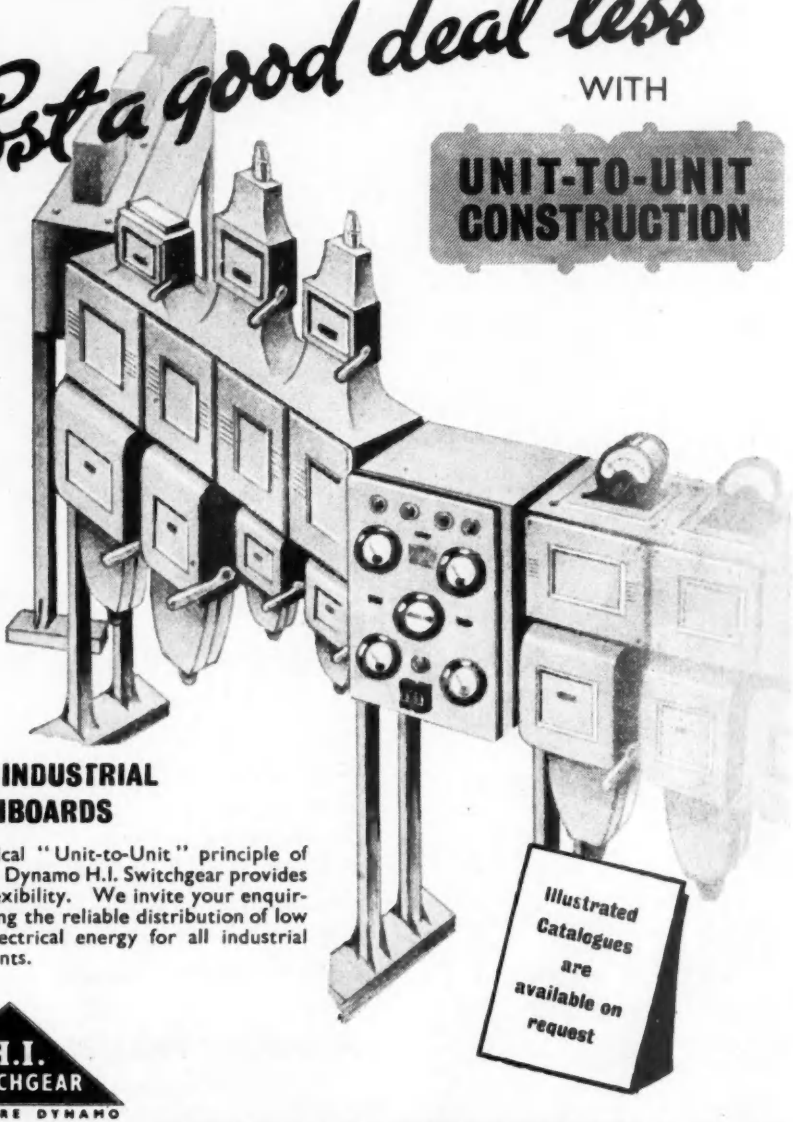
Cost a good deal less WITH

UNIT-TO-UNIT CONSTRUCTION



HEAVY INDUSTRIAL SWITCHBOARDS

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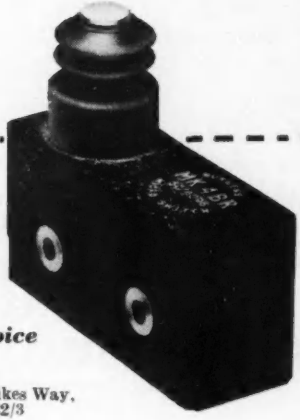

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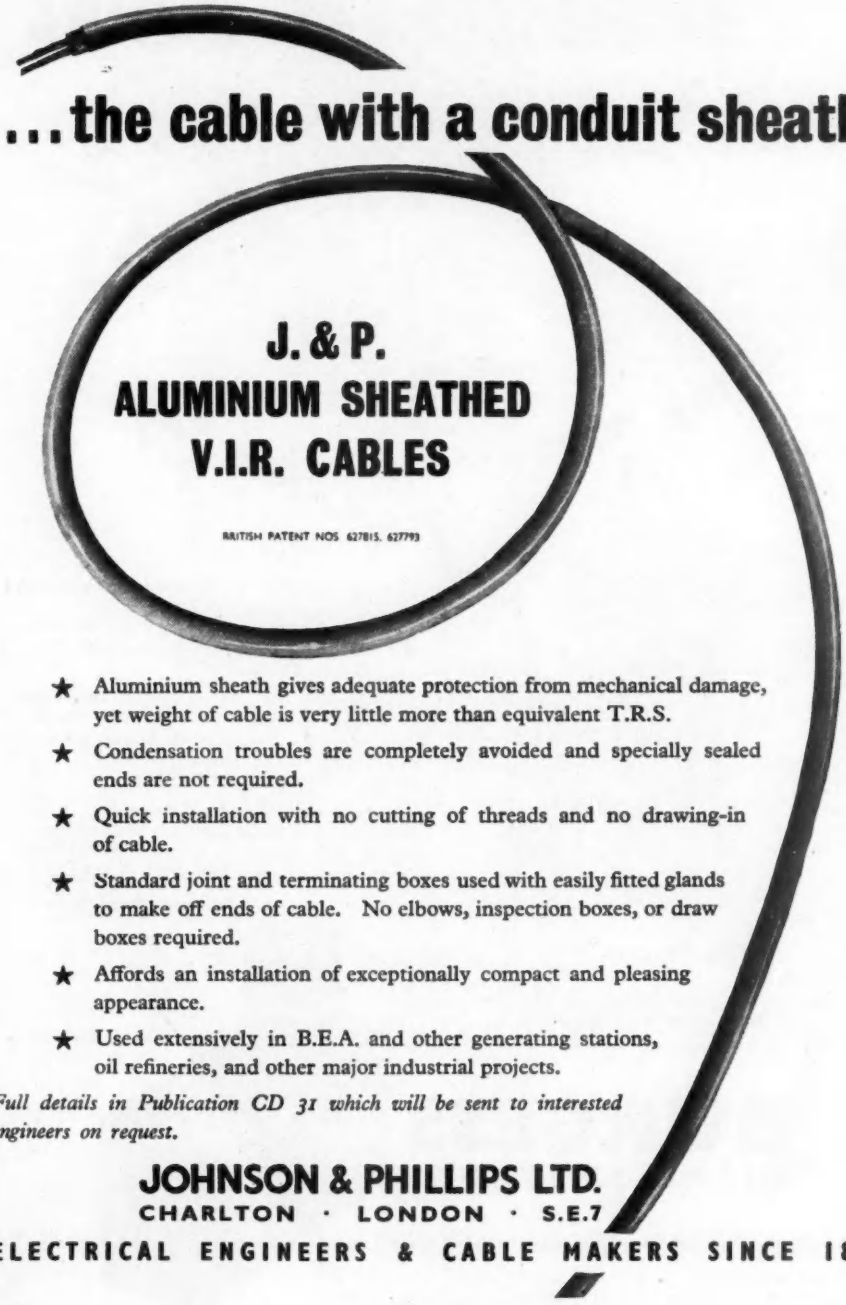
MICRO-SWITCHES

Industry's Automatic Choice

BURGESS PRODUCTS CO. LTD., Micro-Switch Division, Dukes Way, Team Valley, Gateshead 11. Telephone: Low Fell 75322/3



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★ Aluminium sheath gives adequate protection from mechanical damage, yet weight of cable is very little more than equivalent T.R.S.

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★ Affords an installation of exceptionally compact and pleasing appearance.

★ Used extensively in B.E.A. and other generating stations, oil refineries, and other major industrial projects.

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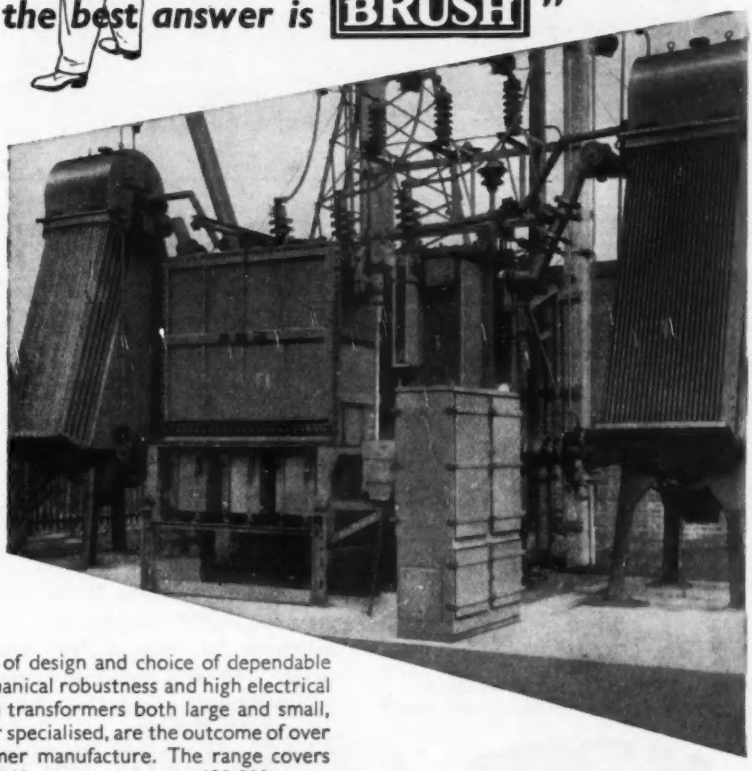
the best answer is **BRUSH** ***"***



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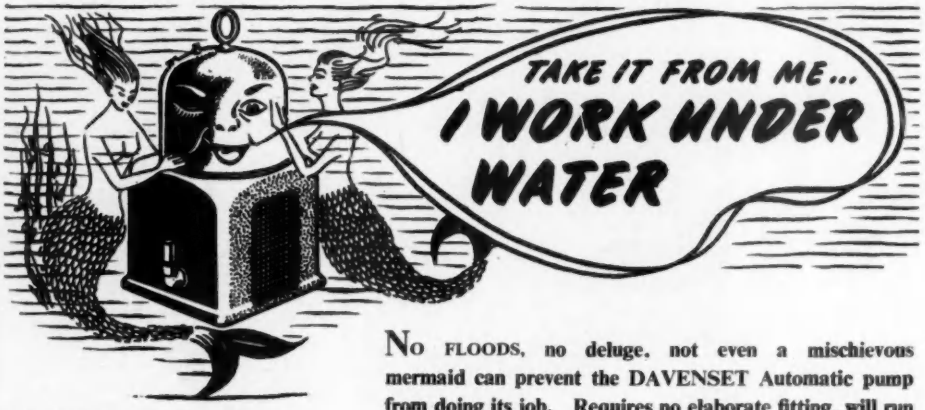

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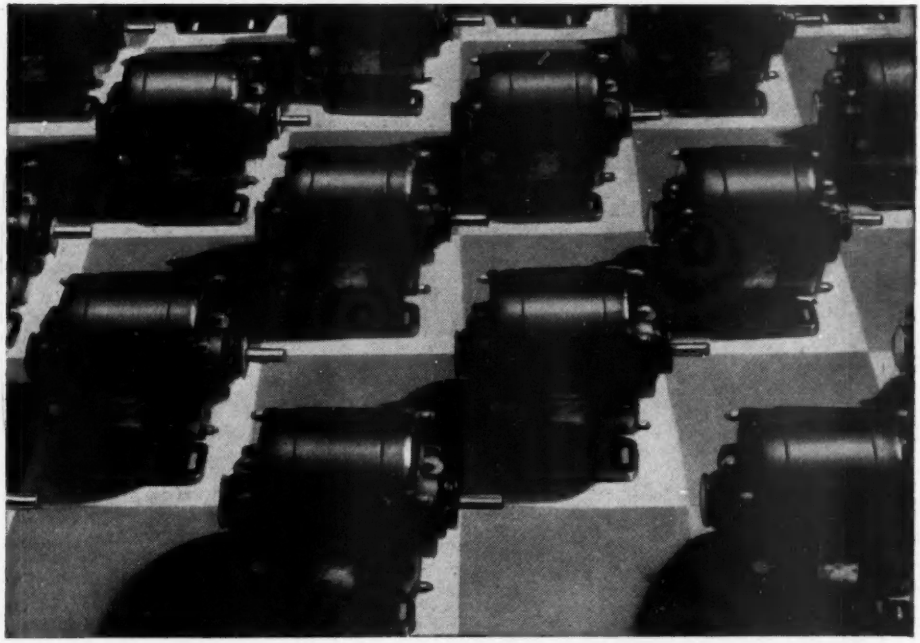

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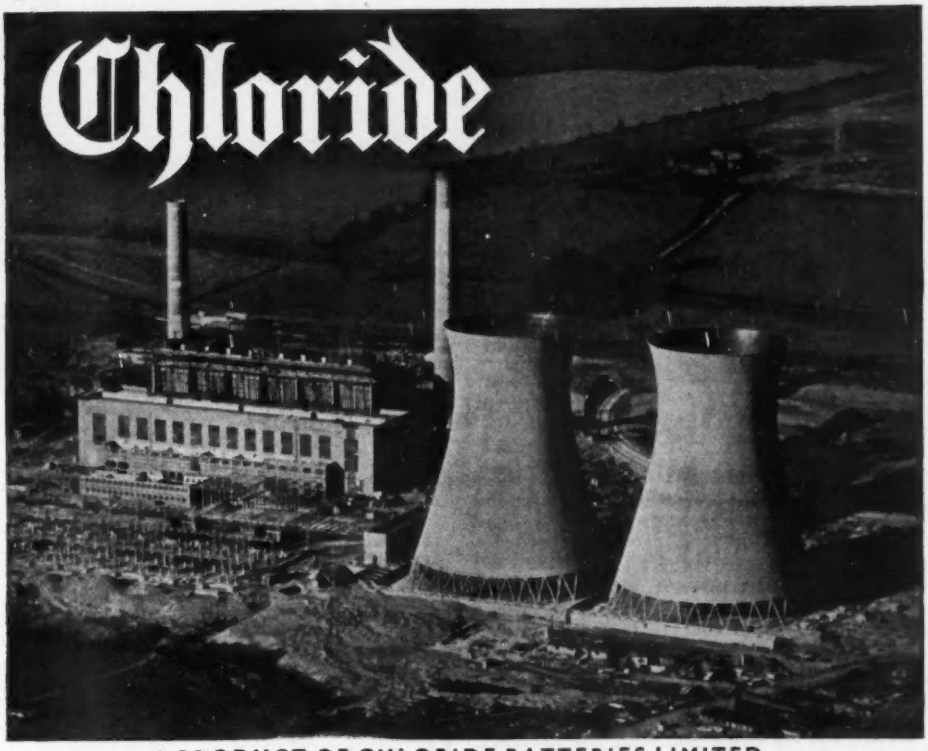
S.39



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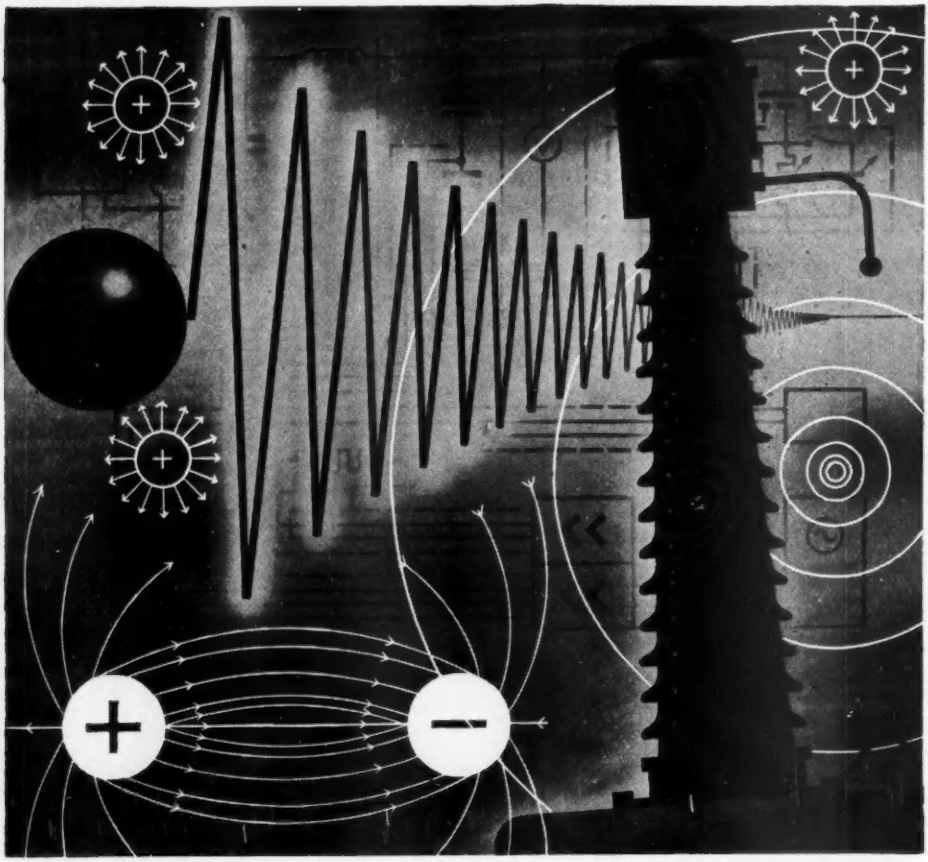

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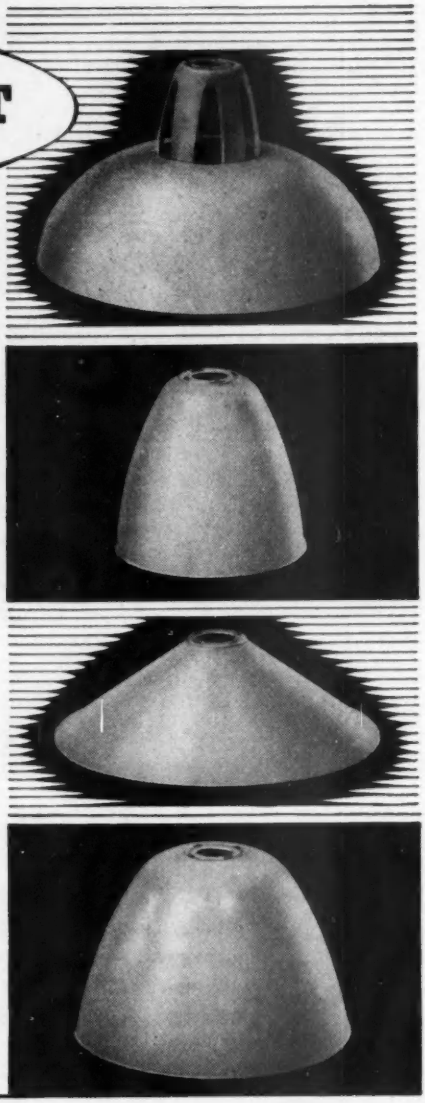

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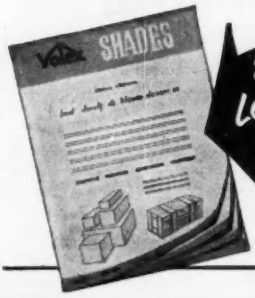

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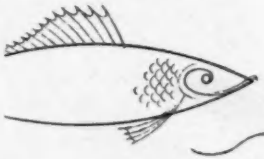

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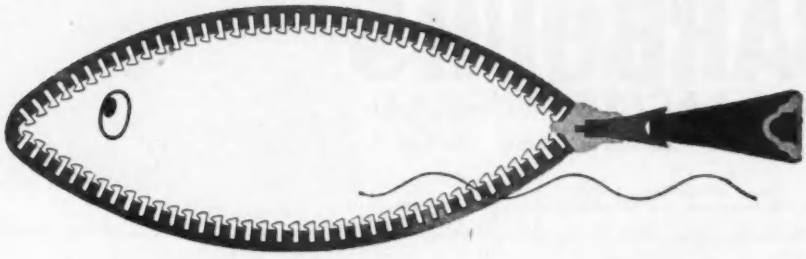

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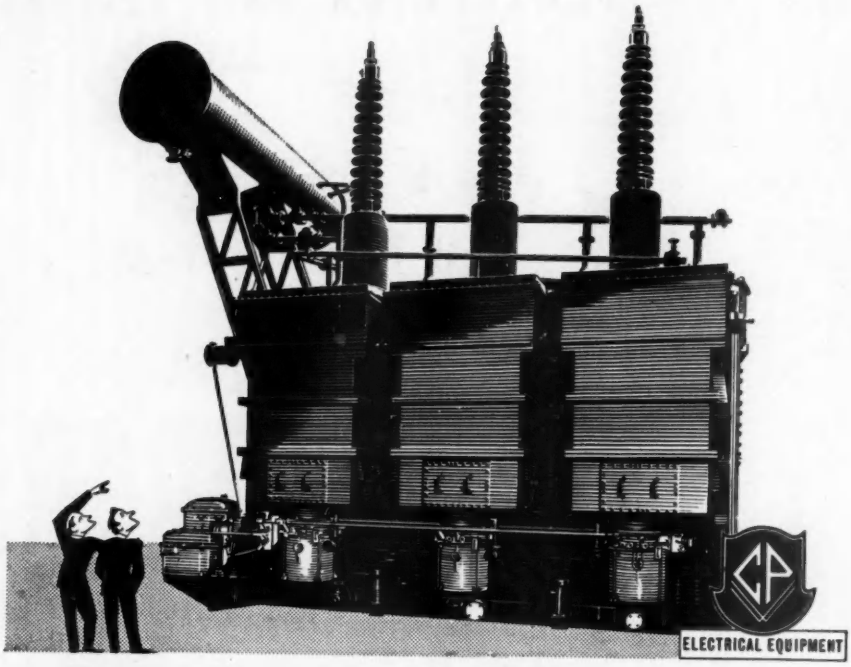

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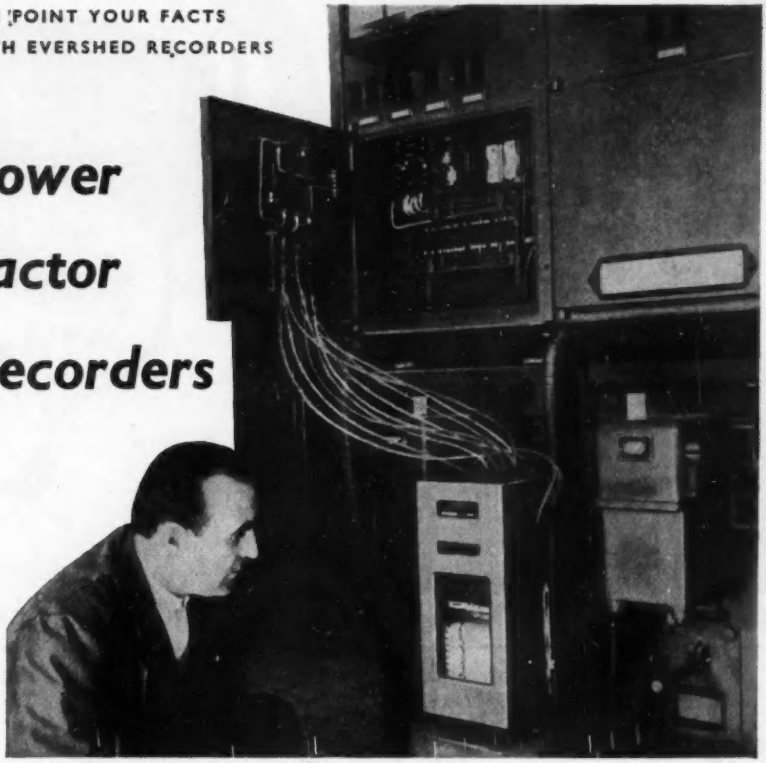

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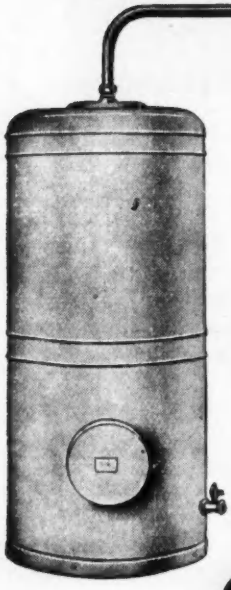

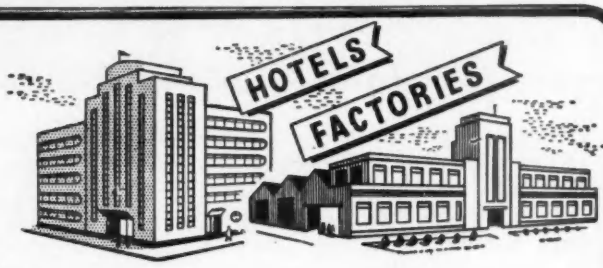

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- A smooth, compact, silent drive.

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by ensuring that you do not exceed your predetermined maximum demand

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3 PHASE MAXIMUM DEMAND ALARM

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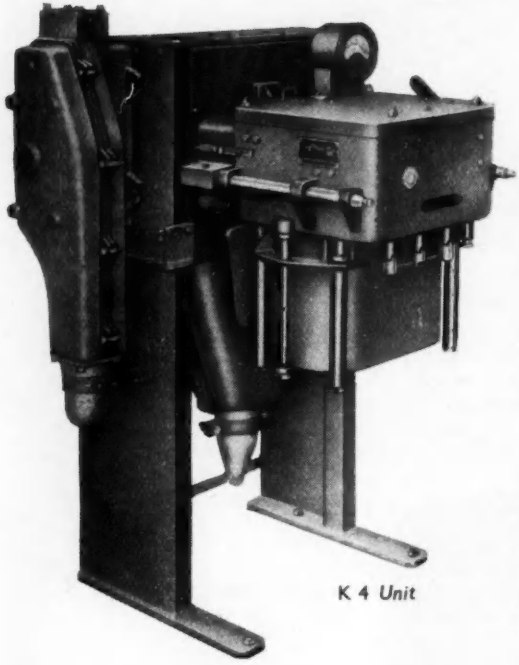
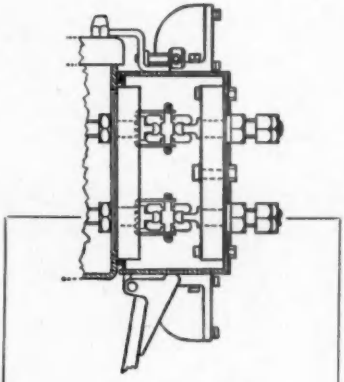


K 4 *Unit*

TYPE **'K'**

INDUSTRIAL SWITCHGEAR



The horizontal drawout isolating contacts are of the multiple finger, high pressure line contact type, mounted on insulation bases. A full system of interlocks is provided in the breaker so that it is not possible to make or break circuit on the isolating contacts.

The type ' K ' range of industrial switchgear has been designed for use on systems up to 660 volts and for normal current ratings up to 1,200 amps. It fully complies with Factory and Home Office Regulations. It is eminently suitable for installation in situations where reliability and robust construction are essential to withstand rough usage under various conditions.

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They are provided with horizontal drawout features and are normally arranged for mounting on a busbar chamber supported on floor fixing pedestals, forming a complete metalclad unit. The circuit breakers can also be mounted on the front of sheet steel panels or cubicles.

The units have been designed to facilitiate cabling, arrangements being available for the termination of all classes of cables and conduits. Cable boxes can be provided for cables entering from below or from above.

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Switchgear Specialists

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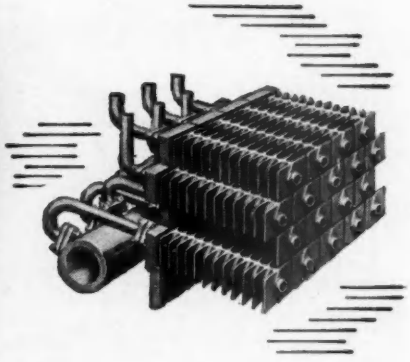
Acclaimed by those who know . . . . Best



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The Type 12 construction means better accessibility, easier and thorough inspection, high heat transfer, minimum loss of draught, resistance to corrosion, joints with the patent pressure seal ring—simple and reliable, easily made and taken apart. Also available with welded joints.

This Economiser scores on every possible count.

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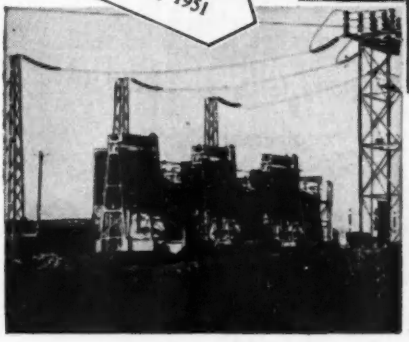
BTH Transformers for the State Electricity Commission of Victoria, Australia:–

Rating: 15-MVA., Type ON single-phase units for 45-MVA three-phase 220-kV bank.

The three units on test at the BTH Rugby Works — November 1950.

In commission in Australia — May 1951



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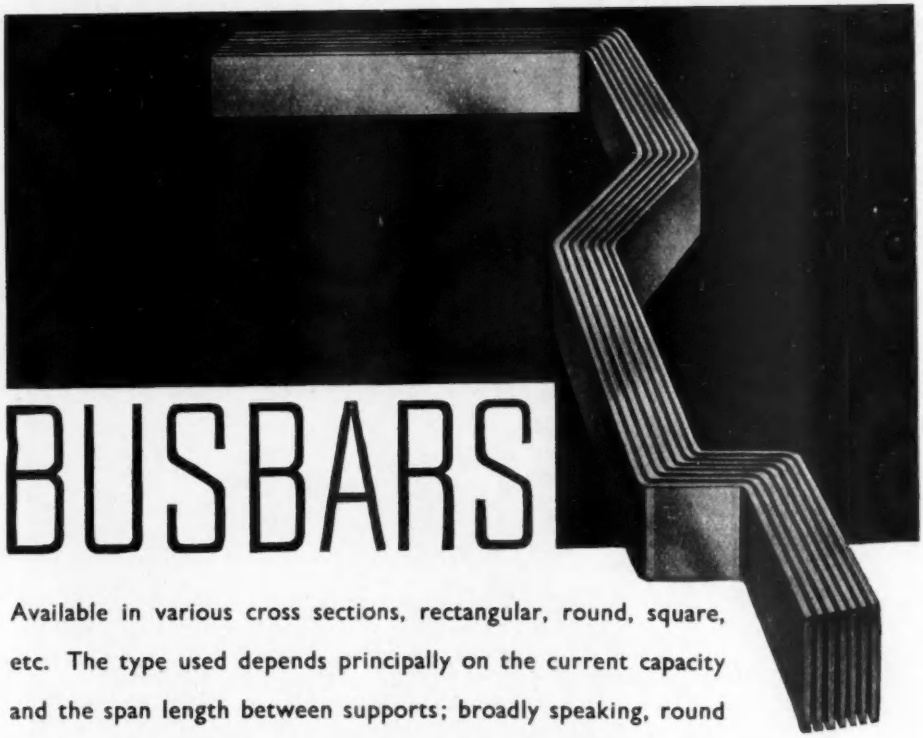

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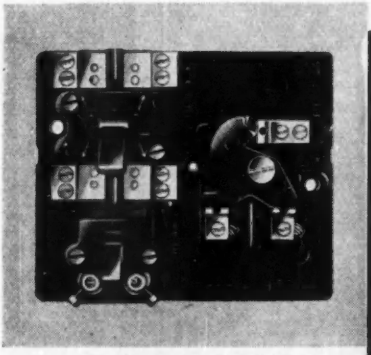

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showing the famous Wylex Switch.

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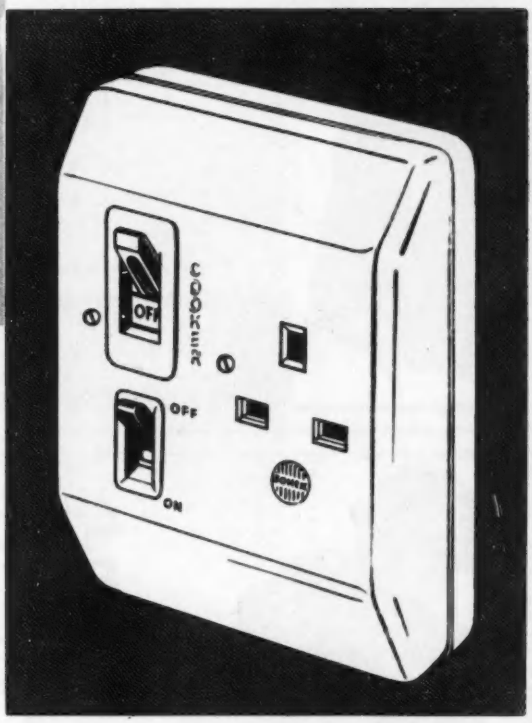

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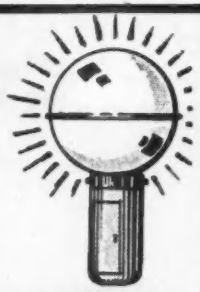

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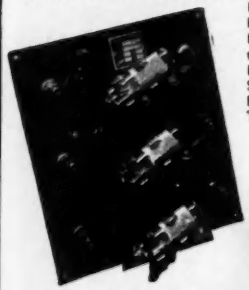

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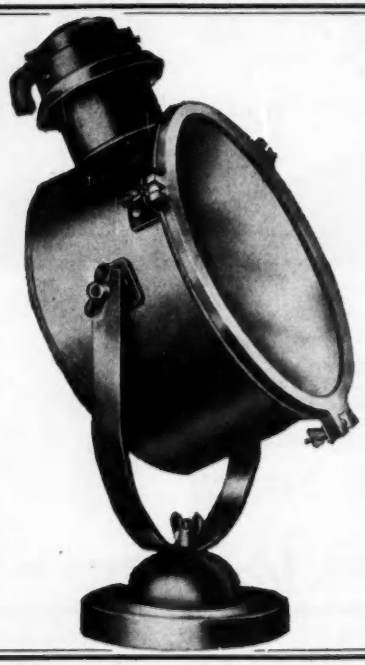

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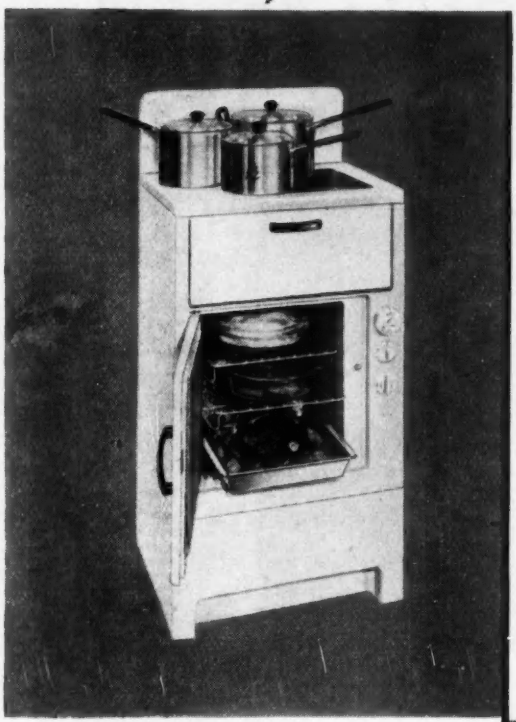

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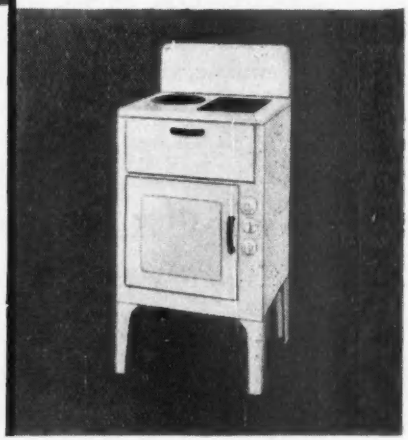

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ELECTRICAL TIMES

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Editorial

CABLES UPRATED

THE announcement that the I.E.E. are to permit the uprating of certain cables is not unexpected, in view of the strong recommendations made by the Ministry of Works Committee on materials economy. Reinstatement of the 1942 War Emergency Regulation was the original suggestion, but the Wiring Regulations Committee has understandably held that subsequent changes elsewhere in the rules make such a simple solution unacceptable. However, since the cables up to 20 amp are effectively uprated by 5 amperes—in some cases 100%—considerable economy should result, and the principal aim of the original recommendation be achieved. One point needs special attention, however: the cable sizes for ring mains are not affected by the uprating.

WASTE HEAT

STEAM - ELECTRIC generation finds in a large chemical works conditions that are nearly ideal for its application. Heat for the evaporation of water and organic liquids and for the encouragement of reactions is conveniently supplied in steam, while the complementary demand for electrical energy comes in the pumps and conveyors as well as extensive plant lighting. The Wilton works of Imperial Chemical Industries, which we describe elsewhere in this issue, offers an impressive example of what can be achieved in efficiency when such an opportunity is fully exploited. No doubt a great deal can be learned from this installation for use in other plants, but there is an equally important negative lesson to be extracted. Quasi-technical enthusiasts who advocate the indiscriminate extension of back-pressure generation in conjunction with district heating for industrial and domestic purposes should note the price that has to be paid in complication. The pipework alone at Wilton should make them pause for thought; but the complications of operation far outweigh even this consideration. At the chemical works these are eased by the steady twenty-four-hour demand and by the precedence that can always be given to steam requirements, the Grid acting as a balancing reservoir to adjust the electrical conditions. Electrical and steam loads, out-of-phase as they would be in a district scheme, would make this operational difficulty immeasurably greater. For engineers, of course, this is an obvious conclusion, but men have to be dealt with who are able to see the superficial advantages without appreciating the deeply seated difficulties which are involved.

STANDARD FIREGUARDS

THE Home Secretary's announcement last Thursday that he hoped to make regulations for the guarding of electric and other fires in the early part of 1953 brings another stage nearer fulfilment a most satisfactory achievement of private Members' legislation. As suggested by Mr. G. Weston in the ELECTRICAL TIMES last August, the basis of the new regulations will be those clauses which deal with guards in the existing British Standard for the construction of gas and electric fires. This section of the standard is being hived-off to form a separate specification, a move which will make possible the use of the B.S.I. "kite" mark as a guarantee that a fire meets statutory requirements. This was a facility much sought after when the Act was being debated in the House of Commons, and this willingness on the part of the Institution to adjust the form of its documents to meet the public need is a wholly commendable example of flexibility in operation. Moreover, this is the second example this week of B.S.I. standards being officially incorporated in Government orders. So long as the various committees of B.S.I. remain both in appearance and fact fully representative of manufacturer and consumer, as well as official opinion, this trend is to be welcomed.

SMOG LAMENT

LONDON's three-day fog has provided plentiful ammunition for the National Smoke Abatement Society. During that persistent gloom the chemical content of the atmosphere one breathed was notably increased, and the ever-watchful Society was not slow to point out the coincidence that "nutty slack" had been available for a few days before. This is no direct concern of the electrical industry, which knows it can offer completely clean domestic heating, but it does raise an interesting point about that contemporary favourite, the "improved" solid-fuel open grate. This is the appliance which really makes the sale of the ingeniously named off-the-ration fuel a possibility; and this is the appliance which—designed for coke burning—clean air enthusiasts of the Society have so often praised. Their changed attitude must have come as a sad blow to advocates of solid fuel, though in view of recent trends perhaps they have become accustomed to losing disillusioned friends. The occasion has provided a useful reminder, however, that the electric fire, in addition to its more important qualities for home heating, gives positive guarantee of a smokeless atmosphere.

JOVE'S STRENGTH

LIGHTNING flashes have always exercised a fascination for electrical engineers and their predecessors, the early scientists. In recent years the practical purpose behind this interest has grown, as the effects of lightning discharges on power transmission systems and on communication circuits have become increasingly important. The resultant spread of investigation is world-wide, and scientists of many disciplines are actively at work on all aspects of the subject. Knowing this, the non-specialist must be surprised to note from a recently published E.R.A. report that the most important factor of all, the current that flows in a discharge, is still a subject of dispute. The intrinsic difficulty that has to be faced lies in the necessity for the use of indirect methods of measurement, and that the still untamed phenomena of atmospheric lightning are as yet inaccessible for experimental investigation at leisure. E.R.A. experiments now proceeding in the London area may advance the certainty of our knowledge in this field: in the meantime the "best estimate" of 200 kiloamps or a little less, remains none the less impressive as a flow of current for all its lack of guaranteed precision.

SILENCE FOR SOUND

MUSIC demands silence as a setting, and in the modern concert hall many devices, acoustic and mechanical, are used to ensure that all extraneous noises are suppressed. Just how big a part this requirement plays in determining electrical details was emphasised to the I.E.E. last week in a paper which describes the installation in London's Royal Festival Hall. Super-silent motors for lift drives are common enough, and their use extended to all fans and pumps, in order to prevent transmission of noise through pipes and ducts is understandable. A preliminary indication of the length to which artistic amenity is nurtured in this remarkable building is the restriction on cable entries to the sound-insulated auditorium, again as a precaution against their conducting in noise from outside. Yet it is in the care taken with the lighting installation that the extreme of caution is reached. Electric lighting can be classed as silent for most purposes, although an aged fluorescent choke may hum slightly, and an arc lamp hiss. This will not do for the standard of the Festival Hall auditorium, however. The possibiity of slight noise from lamp filaments was a factor in deciding not to use thyratron control for dimming; cold cathode lamps were chosen in preference to hot cathode partly because their transformers were quieter than the chokes that would otherwise have been required. Altogether, this business of noise avoidance proved a notable electrical engineering *tour-de-force*. Whether it was fully worth it is a matter for the concert-goer—and the concert-cougher!

Meteor

MERCURY CELLS

Mallory small volume units having long cell life prove widely useful in industry

THE Ruben-Mallory (RM) cell was developed by Samuel Ruben in the early part of World War II, although there had been earlier attempts to develop mercuric oxide—liquid alkaline primary cells. Ruben's development employed a cathode depolariser of mercuric oxide and finely divided graphite compressed into a hard pellet, an amalgamated zinc anode and an electrolyte of potassium hydroxide substantially saturated with zincate. The electrolyte was immobilised in an absorbent spacer-barrier interposed between the two electrodes, the cell elements being housed under compression in an airtight sealed steel case. Although the cell manufactured today is considerably improved over cells first manufactured during the last war, its fundamental features are retained. The cell is now produced in the United Kingdom by Mallory Batteries Ltd., Dagenham.

Applications

The mercuric oxide cell is characterised by high ratio of energy to volume, long shelf life, uniform discharge potential, resistance to environmental conditions of corrosion and to temperature and pressure, and it is mechanically strong and stable. Although the cell will operate at such elevated temperatures as 100° C the performance of extant constructions at rather low temperatures is limited to low rates of drain.

An important application of this type of cell is in the construction of multi-cell batteries for military and other uses. Other uses are in portable test apparatus, alarm systems, and scientific and clinical laboratory instruments. One of the main applications is for the l.t. supply of hearing aids. The uniform open circuit voltage of this system makes it useful as a secondary standard of potential where extreme precision is not required. Because of this characteristic, the cell lends itself as a source of potential for the grid elements of valves. In addition to the reproducible open-circuit voltage the system has a fairly constant discharge potential. Continuous discharge capacity is virtually equal to intermittent discharge performance.

Cell Construction

The cells may be divided into two types, those employing a pressed powder anode and those using a construction based upon corrugated zinc foil. In the first case a special grade of zinc powder amalgamated with mercury is pressed into a pellet or cylinder of desired shape. In the second type a corrugated zinc foil of 99·99% purity is wound into a roll with absorbent paper, the latter to retain electrolyte at the entire interface of the anode. After saturation with the electrolyte, the anode is amalgamated by the addition of a predetermined amount of liquid mercury to the roll of zinc.

The liquid electrolyte, of about 35-40% potassium hydroxide, in which is dissolved a

In the illustration above are some typical mercuric oxide cells produced at Dagenham. In the top row are military type tabbed cells whilst in the other rows are commercial type cells RM502 and RM12 being in the foreground

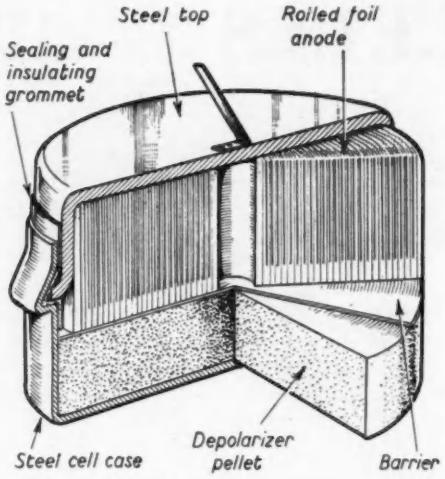


Fig. 1. Typical rolled anode type unit cell

small quantity of zinc oxide, is retained in a cellulosic separator material. In the case of the wound anode type cell, the absorbent paper referred to above is the absorbent, while in the case of pressed powder cells several layers of a cellulose felt are used.

Interposed between the absorbent and the cathode is an ion-permeable barrier. The function of this barrier is to prevent migration of particles from the depolariser to the anode and is usually parchment paper placed directly on the depolariser surface. The depolariser is an intimate mixture of approximately 92% red mercuric oxide with 8% micronised graphite to impart electrical conductivity. The mixture is either moulded under high pressure directly into the cathode member, or pressed as a discrete part and assembled into the cell depending on the type of cell produced.

All cells are tightly sealed to prevent loss of electrolyte, to increase rigidity and to avoid access of air to the active materials. All cells have one external member, the negative terminal, which is generally termed the cell top and forms part of the closure. This part must be of material electrochemically suitable for contact with the anode in the presence of electrolyte; a tin-plated steel top is preferred although copper and certain of its alloys are also suitable.

Steel is also most suitable for the other external cell member, and is usually nickel-plated to retard atmospheric corrosion. In addition, steel is inert to the electrolyte and to the depolariser with which it must make good contact. This part serves as the positive terminal and is termed the cell case. The cells are tightly closed by deforming the edge of the case around the edge of the top from which it is insulated by a sealing gasket. Polythene and Neoprene are suitable materials for

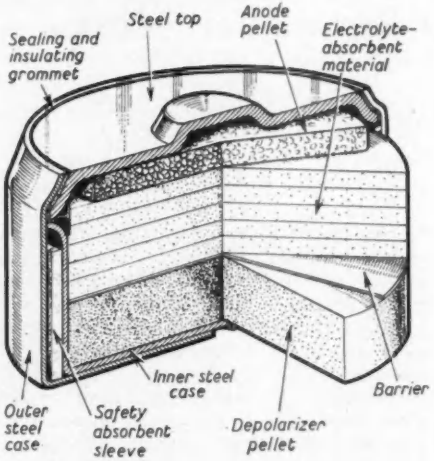


Fig. 2. Typical "A" supply unit cell

gaskets, the latter being used in cells for military applications or where abnormal temperatures are encountered. Cut-away sections of two typical cells are shown in Figs. 1 and 2.

Individual Cells

For individual cell applications where units are not enclosed in a battery container the design has been arranged to take care of any abnormalities that might possibly develop in the cell. For example, when there is an electrochemical excess of anode zinc over depolariser, hydrogen gas is liberated at the cathode member after the depolariser is consumed if the cell is left on circuit. Under such

TABLE 1.—DIMENSIONS AND RATINGS OF WOUND-ANODE MERCURIC OXIDE CELLS

No.	Dia. in.	Height in.	Volume cu in.	Weight oz.	Capacity mAh	Min. Short Circuit current Amp	Max. Recorded drain mA
1R	0·606	0·490	0·14	0·28	650	0·45	20
2R	0·819	0·518	0·27	0·56	1,300	0·80	30
3R	0·973	0·523	0·38	0·84	2,000	1·20	50
4R	1·187	0·541	0·60	1·30	3,200	1·80	70

TABLE 2.—DIMENSIONS AND RATINGS OF PRESSED-POWDER ANODE MERCURIC OXIDE CELLS

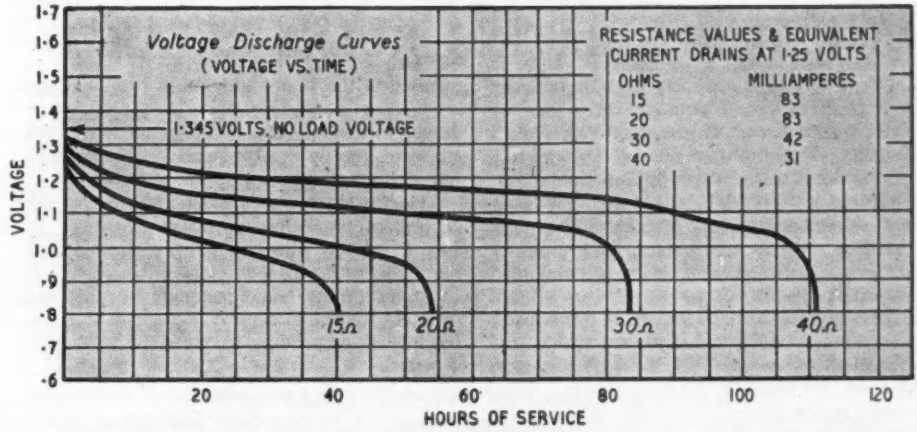
No.	Dia. in.	Height in.	Vol. cu in.	Weight oz.	Capacity mAh	Min. Short circuit current Amp	Max. Rec'd drain mA
RMX39	0·606	0·230	0·065	0·14	275	0·40	10
RM1	0·625	0·650	0·20	0·43	1,000	0·60	50
RM3	0·977	0·660	0·50	1·10	2,200	0·60	50
RM4	1·192	0·660	0·74	1·65	3,400	1·10	70
RM502	0·546	1·957	0·46	1·05	2,400	1·20	170
RM12	0·625	1·960	0·60	1·60	3,600	1·80	200

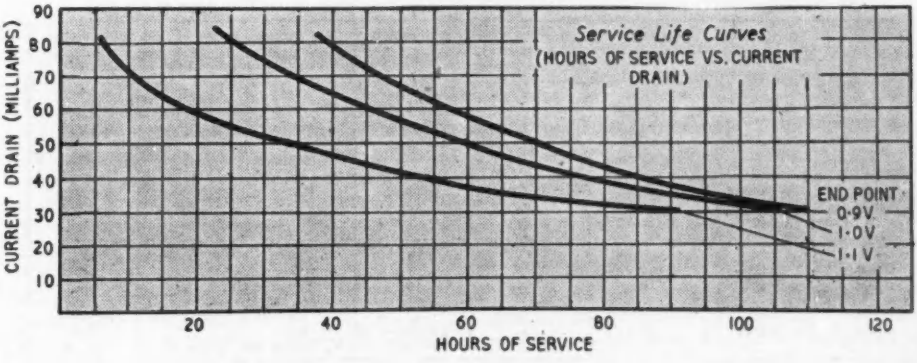
conditions sufficient pressure could be developed to rupture the cell. In practice a "balanced" construction is used in which there is a slight excess of depolariser over that theoretically required for the zinc anode. As a further precaution against the possibility of cell rupture from such unusual causes as local action at the anode, unbalanced construction, externally applied voltage, etc., an improved venting arrangement may be used. Essentially the cells are made with two cases, the outer effecting a seal with the top in such a way as to hold the latter in sealing relationship with the top edge of the inner case. If abnormal pressure develops inside the cell, the top raises slightly to permit venting into the annular space between the two cases. Any electrolyte vented is retained by an absorbent sleeve in this space, and any gas escapes through a hole in the outer case. Fig. 2 shows this construction.

Cell Electrochemistry

The overall discharge reaction of this system may be written as the following equation:

Fig. 3 shows typical discharge curves obtained from the Mallory RM4 cell which is on the right of the middle row in the illustration at the head of this article. Indicated performance is at 70° F, and all curves represent continuous load conditions





$Zn + HgO + H_2O \longrightarrow ZnO + Hg + H_2O$

Two Faradays of electrical energy are liberated per mole of active electrode material. Since water appears on both sides of the equation the net result is that no water is taken from the electrolyte.

The theoretical voltage of 1·345 volts for the system agrees closely with the measured value of stabilised cells. The stability of the cells is due largely to the fact that the electrolyte is approximately saturated with potassium zincate, derived from the dissolution of ZnO in KOH. The presence of the zincate ion inhibits the chemical attack of the potassium hydroxide on the zinc anode. In addition, uniformity and stability is obtained by the use of constituents of a high degree of purity.

The energy-volume ratio of the electrode material is high, since 1·00 gram of mercuric oxide and 0·302 gram of zinc will produce 0·247 amp-hr of electricity. At low rates of drain this amount of energy can be realised but at maximum rated drains somewhat less is obtained—about 10-15% less than theoretical value, depending on cell construction. These figures are based on an end-point voltage of 0·9 volts.

Electrical Characteristics

Tables 1 and 2 show dimensions, ratings, etc., of both wound and powder anode type cells.

The heading illustration shows some of the Mallory cells now being produced at Dagenham.

Typical discharge curves obtained on the Mallory cell, in this case the RM4 cell, are shown in Fig. 3. Storage life tests indicate a service life reduction of only about 7% eighteen months after manufacture.

Summary

The important characteristics of the Mallory Mercury Cell may be summarised as follows: 1, High ratio of energy to volume; 2, Long shelf life; 3, Leak-proof dimensionally stable construction; 4, Uniform discharge voltage; 5, Reproducible constant open circuit voltage; 6, Operable over considerable range of temperatures and pressure; 7, Resistance to severe atmospheric corrosion; 8. Ability to withstand impact and acceleration effects.

I.E.E. CABLE RATING RULES RELAXED

IN the interests of economy of materials, the Council of the Institution of Electrical Engineers has issued temporary relaxations to the 12th edition of the Wiring Regulations. This effects Table 5, which deals with the current rating of v.r.i., p.v.c., paper and varnished-cambric insulated cables. In general, the effect is to uprate the smaller cables, the ratings of which have not been dictated by thermal considerations alone.

The revised Table 5, which is reproduced below, shows the higher ratings for cables with conductors of up to 7/·029 in dia. These correspond to the values adopted in 1942, but the limits of voltage drop have been reduced to agree with the values shown in the 12th edition. The three sizes from 3/·029 upwards are each uprated by 5 amperes in Column 3.

The revision of Rules was undertaken at the request of the Ministry of Works (see E.T. July 21, 1952) who originally suggested that the whole of the 1942 relaxations be reinstated.

Copies of the relaxation may be obtained from the I.E.E., Savoy Place, W.C.2, on receipt of an addressed envelope with 1½d. stamp.

TEMPORARY RELAXATION TO TABLE 5 OF I.E.E. RULES

Current rating for vulcanized-rubber-, p.v.c.-, impregnated-paper-, or varnished-cambric-insulated cables. Note: The requirements of Reg. 201 (c) (ring mains) are unaffected by the relaxations shown in this table.

Conductor		Not more than:—Four single-core cables, or two twin (or concentric) cables, or one three-core cable			Not more than:—Eight single-core cables, or four twin (or concentric) cables, or two three-core cables		
		Current rating for d.c. or single-phase or 3-phase a.c.	Approximate length of run for 1-volt drop with current rating in Col. 3.		Current rating for d.c. or single-phase or 3-phase a.c.	Approximate length of run for 1-volt drop with current rating in Col. 6	
Nominal cross-sectional area	Number and diameter (in.) of wires		D.C. or single-phase a.c.	Balanced 3-phase a.c.		D.C. or single-phase a.c.	Balanced 3-phase a.c.
1	2	3	4	5	6	7	8
sq. in.		amperes	ft	ft	amperes	ft	ft
0·0015	1/·044	5	18	21	5	18	21
0·002	3/·029	10	12	14	8	14	17
0·003	3/·036	15	11	13	10	17	19
0·0045	7/·029	20	13	15	15	17	19

Voltage & Current Transformers

THEIR REQUIREMENTS AND USE IN SWITCHGEAR

A CRITICAL appraisement of modern developments in the design and use of "Voltage and Current Transformers Associated with Switchgear" was given last week by Messrs. W. Gray and A. Wright, to a Measurements Section meeting of the I.E.E. The paper was restricted mainly to those instruments required for fault clearance, protection and operation, the problems of metering being largely untouched.

Voltage Transformers

B.S. 81 : 1936 specified standard rated burdens up to a limit of 200 VA, and had four classes of accuracy. Class A was recommended for very-high-accuracy integrating metering; Class B was for commercial metering and was most commonly specified ; and Class C was suitable for all applications except accurate metering. It was with this last class that the paper mainly dealt.

There were two types of voltage transformer: the electromagnetic type, which were fundamentally similar to power transformers, and the capacitor type. In the former class, size reductions had been made by using special core materials and in order to stand up to high impulse voltages careful insulation and impregnation was necessary. Certain synthetic resins had been developed which appeared to have good properties. Fuses had not proved a really satisfactory way of protecting such transformers, as such fuses had to stand magnetizing surges and would not therefore protect an interturn fault.

The capacitor type consisted of a voltage divider composed of two capacitors in series, the l.v. unit feeding an intermediate transformer through a reactor. This type was sensitive to frequency variations and was also only really economic in the high voltage field. However, the electric strength of the capacitor was so high that protection could be eliminated.

Voltage transformers were largely used in synchronising schemes, and the paper gave some illustrations of typical connection schemes.

Current Transformers

B.S. 81 : 1936 did not attempt to classify current transformers. A new specification was being prepared in order to classify transformers for non-balanced forms of protection. Three classes were proposed S, T, and U, corresponding to ratio errors of $\pm 3\%$, $\pm 10\%$ and $\pm 15\%$. Fundamentally, however, the requirements of a protective transformer were that it should be possible to obtain a sufficiently low fault setting and ensure correct discrimination. Consideration of saturation effects and the relationship between transformer size and burden were discussed at some length.

On the question of open-circuiting, B.S. 81 : 1936 specified that the secondary circuits of current transformers should always be closed when there was a current in the primary circuit. There was, however, always a possibility that they might be left open-circuited, accidentally, for long periods and it was, therefore, desirable that transformers and their secondary connections should be capable of being open-circuited continuously. The factors causing breakdown under these conditions were the open-circuit voltage and the overheating of the transformer due to the eddy-current loss in the core. Generally, a guaranteed period of about one minute was given to allow for insulation tests to be carried out. The rapid change of flux under open-circuit conditions nevertheless resulted in high secondary voltages, and these values were higher for Mumetal than for Stalloy, even though the r.m.s. value was lower. The value of the voltage depended on the permeability of the material and, to a lesser extent, on the eddy current losses. A typical figure for a 1-amp transformer was between 1 and 2 kV, but some of the larger current transformers in use could give open-circuit voltages of 7·5 kV.

Under open-circuit conditions associated cables would be subjected to these high voltages. Those with 250 V rubber insulation and those with 660 V oil-impregnated paper had breakdown voltages of the order of 15-20 kV peak, and could, therefore, stand the open-circuit voltages for long periods. Switching surges in general lasted for such short time periods that they could be withstood by the average current transformer.

Positioning of current transformers was of considerable importance, as the protection zones depended on the location of the initiating protecting signal. In general, the current transformers should be as close to the circuit

breaker as possible, and the insulation level should be as high as possible.

Conclusions

In their conclusions, the authors were of the opinion that modern developments in core materials would enable voltage transformers to be reduced in size. Fuses in the primary circuit, were of doubtful value for 11 kV and above. Capacitor voltage transformers were uneconomic below 110 kV.

On current transformers, they thought that it was impracticable to design for non-saturation under through-fault conditions. Reasonable-size transformers were, however, adequate if protective equipment was designed to have as small a burden as possible and the lowest possible secondary rating was used. They recommended a 1-amp rating for 33 kV and above. For primary insulation, it was thought that for e.h.v. post type transformers the oil-impregnated paper bushing was best.

DISCUSSION

In the discussion, MR. N. ASHTON (M.V. Instrument Transformers) said that it was essential that if the current transformer was accidentally open-circuited the insulation of the transformer should not break down. Those with a high number of turns might become hot, and, if left in that condition for any length of time, they would become a danger not only to themselves but also to the insulation of the bushings.

The older type of re-wireable fuses probably gave more trouble than the transformers themselves, but over recent years experience with the modern fuses had been very good and there had been a negligible amount of trouble. He would rather have a fuse which would blow with about one amp of fault current than leave it to a protection which might let 300 to 500 amps of fault current loose in a transformer tank, which might be far more dangerous.

MR. J. G. WELLINGS (B.T.H.) said the authors had stated that the use of compensating current transformers had largely dropped into abeyance, but that was not so with his firm. The use of new metal had greatly eased the metering problem.

The authors were cautious in what they said about the use of oil impregnated paper for voltage transformers, but it had been used for many years with voltage transformers and power transformers with absolute success, although it was desirable to have some form of breathing arrangement.

MR. M. KAUFMANN (B.E.A.) said the paper had given a brief pre-view of some of the provisions of a forthcoming new British Standard for protective transformers, a useful function of which was to standardise terminology.

MR. L. C. WALSHE (Kennedy and Donkin) asked what they were to have if they were not to have fuses, and suggested that there might be a good reason for using Buckholtz relays on higher voltage systems. As to the lower voltage systems, no doubt space could be made available, but he assumed that the authors would not advocate the expense of fitting such relays on a 33 kV withdrawable transformer. The other possibility was some sort of balanced voltage scheme which might or might not be to the liking of the authors.

MR. W. T. J. ATKINS (B.E.A.) referring to the analysis of balanced systems, said that by a process of inspired graphical guesswork the authors had shown how saturation could be taken into account, and they must be congratulated on the fact that it worked. Their empirical curves provided confirmation that their conclusions had been well directed. Nevertheless, these days one might make use of a differential analyser.

MR. D. E. SINGER said that the authors had pointed out that a great reduction in the size of voltage transformers could be achieved by the use of the cold rolled silicon iron alloys and cobalt iron alloys. While he appreciated that the higher flux densities would obviously have some bearing on the ultimate size of the voltage transformer, did not insulation considerations mainly dictate the physical size and space factor?

He wondered if the authors had investigated the possibility of omitting the metallic foils or interlayer capacitances, since the layer winding in itself enhanced the impulse distribution.

He was rather sceptical about voltage transformers and current transformers being embedded in a synthetic resin insulation. The samples he had seen had been very hard, with little or no flexibility, and with even normal heat expansion hair-line cracks had developed.

With regard to the permissible time that a current transformer could be left on open circuit, his experiments had proved that the time element was of little consequence. It was the very high peak voltage developed under accidental open-circuiting which initiated failures.

MR. E. H. BIRCH, referring to synchronising schemes, said the authors had described a method which they said economised in the number of multicore cables between the switchgear and the control board. However, account ought to be taken of all the isolating switches which formed part of the switchgear installation. The number of auxiliary switches probably had to be multiplied by three, and the more auxiliary switches there were, the more sources they had of open-circuiting and trouble.

He pointed to the danger that if a voltage transformer was isolated on the primary side and it was paralleled with other voltage transformers on the secondary side, it was energised backwards, and anybody touching the primary connections might get a fatal shock. The fuses connected to the secondary side of the voltage transformer had to be regarded as a point of isolation.

MR. GREY replied to the discussion.

Our readers' views . . .

Word Coining

YOUR non-technical contemporary the *Sunday Times* has recently been perturbed (with some reason) by the Admiralty's adoption of the word "earlierized." Its contributor, "Atticus," has been advised by someone, who is *au fait* with the joint proceedings of the "Mechanicals" and "Electricals," that another debased word in the shape of "unitized" has appeared in a Paper on Dunston B.II Power Station. "Atticus" has stigmatized this word as a philological atrocity. I was moved to write the following letter in explanation and protest:

"'Atticus' feels that in using the word 'unitize' the British Electricity Authority has perpetrated a philological atrocity. He may care to know that in the North East Coast power station concerned, there has been successfully introduced the practice of a steam-driven generator drawing its energy from its own boiler instead of a general source. The machine and the boiler are operated as a unit; the two have been turned into one—they have been unitized.

"The word which has made 'Atticus' and his informant writhe, appears in at least one standard dictionary, and is surely not to be classified with that genuine atrocity 'earlierized.'"

But the *Sunday Times* Editor is cannily sitting tight and not publishing the appeal against the judgment of its pundit !

G. E. Moore

DARLINGTON

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Complicated Interference

METEOR'S note on this matter is worth very great consideration if our own experience is anything to go by.

In our equipment we use a very fine and well tried thermostat, which often operates ten years or more. There have at times been complaints from the Post Office Engineers of interference which we have investigated. In practically every case we have found the fault due to a cheap or home-made wireless set, a fault in the installations, or an area with faulty B.B.C. transmission, where even the best of sets have difficulty in picking up anything.

Surely until you have a minimum standard of transmission everywhere, with a minimum standard of wireless and/or T.V. set, most of this suppressor stuff makes nonsense.

One other point I should mention. The P.O. Engineers tested certain of our equipment, gave a highly technical report of just no practical value, and suggested we should use another type of thermostat and a certain suppressor. This was in spite of the fact that we had already tested all the types of thermostats suggested, and that our equipment often lasts ten years or more.

We found none of their thermostats stood up to our conditions for ten weeks, and when asking the P.O. Engineers if they would guarantee the particular types for the life of our equipment, nothing more was said—Q.E.D.

A. V. Summers

MILLIWATT LTD.,
LONDON, N.W. 1

◆ ◆ ◆

Small Motor Repair

MR. PELERIN has raised one or two points about my article in your issue of November 20. I also agree with his comments, with these provisos.

First, while the normal requirements of commutation can certainly be met with a range of 50-60 grades, the figure "2,000" was used to illustrate the possible variety obtainable from one maker and more especially to emphasise the complex nature of the subject, a complexity few people realise.

Second, I omitted further reference to the question of flush and undercut commutators because this was dealt with in an article published in February, 1951, in this journal and in other publications of mine.

Third, most of us are aware of the excellent replacement parts available from reputable suppliers, but it was specifically stated in an earlier article that we must not assume that replacements are always immediately available at an hour's notice. On this premise, the necessity for repair still remains.

Karl Wilkinson

EASTBOURNE

Measuring Lightning Currents

Maximum Magnitude Discussed in E.R.A. Report

CURRENTS flowing in lightning strokes can be very heavy—but just how many thousands of amperes? This question is discussed by Messrs. R. H. Golde, A.M.I.E.E. and T. J. Browne, B.SC., A.R.C.S., in a recently published E.R.A. report*. After a critical discussion of existing information, these authors conclude that further information is required, both on the upper and lower limits of lightning current amplitudes.

Interest in this detail of the subject is excited by recent investigations of the mechanism of the lightning stroke, which have shown that the current discharged in a lightning stroke to earth is the fundamental parameter in terms of which the principal effects of the stroke can be expressed. Where the effects of lightning on transmission lines is under discussion, the information required is the amplitude and wave shape of the lightning currents, and their frequency of occurrence. In addition, the magnitudes of lightning currents have a direct bearing on the necessary discharge capacities of lightning protective apparatus.

Methods of Measurement

Most previous measurements of lightning currents have been made using magnetic links. These are short lengths of iron, mounted near to such downward conductors as the legs of transmission towers, and they have the advantage that they indicate the maximum amplitude of current practically independently of wave-shape. They can also give information on the frequency and distribution of direct lightning strokes to a line.

One other method of estimating the amplitude of lightning currents is an analysis of magnetic field changes produced by strokes at distances of up to a few miles. This method, however, involves assumptions as to several parameters of the lightning discharge, which have previously been criticised by the Association. It is considered that results obtained by this method must at present be regarded as unsatisfactory.

Unfortunately, in the case of lattice towers, difficulty arises if there is not adequate knowledge of the distribution of the current in the various paths down the tower. This follows because each link is subjected to the instantaneous sum of the individual magnetic fields produced. From this it follows that measurements on tubular steel poles, or on the earthed down leads of wooden poles, should provide the most reliable data.

The most frequent method of measuring the current in a stroke to a transmission line is to add algebraically the currents discharged through neighbouring towers believed to have been affected by the flash. It has been shown, however, that phase-displacement effects may cause the value obtained to be too high by as much as 50%. Better results may be obtained when links are fitted to earth wires, though here again values may be too high.

Experimental Results

Recent results from various reports show currents in transmission towers as high as 150 kA. For currents in the stroke channel, values of over 200 kA are noted, but in most cases these result from the erroneous "adjacent tower" addition. It is suggested that the maximum current to be deduced from these data is 160 kA.

In order to obtain the required information more accurately, the E.R.A. is attempting the measurement of currents that flow in the lightning conductors of tall chimneys. At the time of preparation of the report (March, 1951) some 150 chimneys in an area readily accessible from the Perivale laboratories had been equipped with links. These are arranged so as to be capable of covering a range of currents from 600 to 300,000 amp. It is further hoped that currents down to 200 amp may be detected.

Conclusions

It is concluded that magnetic links are still likely to give the most useful information. A laboratory investigation of the effect of repeated discharges on the residual magnetism exhibited by magnetic links has indicated that a link subjected to discharges of like polarity behaves within a few per cent. as though it had been subjected to a single current, with the same amplitude as the highest current pulse involved. Methods were also found of analysing individual links subject to current reversals, as an alternative to the usual method employing two links at different distances from the current carrying conductor.

* *The Measurement of Lightning Currents: Technical Report S/T57, price 12s.*

FIBREGLASS LAMINATES

Applications and Use in the Electrical Industry

FOR many years synthetic materials have been used as insulators in the electrical industry, and in order to combine strength with good electrical properties, many of these materials are produced in laminated form. The characteristics of the laminate are governed by its two main constituents, the basic material and the resin binder. To obtain good electrical characteristics of the final product, both these constituents must in themselves be electrically of high quality.

Three main types of basic "filler material" are in general use. These are (*a*) cellulose bases which consist of paper and cotton cloths, (*b*) asbestos, in the form of paper and woven cloth and, (*c*) more recently Fibreglass, mainly in the form of woven cloth.

Several advantages in the use of Fibreglass are readily apparent. It has good thermal endurance and cannot carbonise, it does not absorb moisture, it possesses good chemical resistance and has a high physical strength.

Fibreglass Materials

Two types of Fibreglass are generally used for electrical work, one being a yarn of the continuous filament type and the other staple fibre. In this country the former is generally used, but in America usage is divided about evenly between the two. The cloths used in the production of laminates are usually of 3, 5 or 7 mils thickness, and are suitable for standard methods of impregnation with resin varnishes, being produced in continuous lengths up to 100 yards, and also being capable of supporting their own weight in drying towers.

Binders

Three types of resin, well known in the electrical industry, are used. These are the Phenolic, Melamine and Silicone resins. The Phenolic types have been used for many years as impregnating varnishes, and are commonly used for general types of laminates produced from paper and cotton. More recent are the Melamine types which have important properties of chemical resistance, hardness, toughness and arc resistance. Finally we have the Silicones with their outstanding heat-resistant properties and their exceptional electrical properties. By combining Silicones with inorganic fillers such as Fibreglass, the working temperature limit can be stepped up to 250° — 300° C.

The Fibreglass resin tubes above were made using woven cloth and mat

Treatment

As it comes from the manufacturers, the glass cloth is sized to produce a lubricant within the threads. This permits the glass fibres to slide over each other without much friction and thus largely eliminates breaking of the individual glass fibres. This size, however, prevents the intimate bonding of filler and binder, and must thus be largely removed prior to further processing. Many treatments to perform this have been and are still being developed. The simplest treatment consists of oxidising the size by passing the cloth over heated rollers at a temperature of about 300° C. This reduces the size content from about 2·5% to 0·5%. For further treatment if electrical properties, as opposed to mechanical, predominate, the cloth can be subjected to a higher temperature of about 400° C. This leaves about 0·2% ash content, but makes the cloth difficult to handle. Washing with detergents and combinations of

washing and heating have also been used.

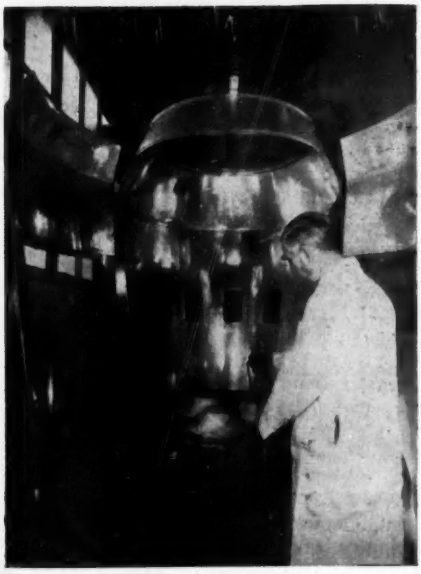
The difficulty in handling is of course due to the brittleness of the cloth caused by internal strand friction. However, the applied resin may itself provide the necessary lubrication and thus in the final laminate some of the mechanical strength may return.

Impregnation

Standard impregnation methods are generally used. Continuous webs of glass cloth are dipped in the appropriate resin varnish, dried in vertical or horizontal drying ovens and then reeled up at the dry end. Phenolic and Melamine resins are employed as solutions in alcohol and/or water, while Silicones are in solution in toluene. The Silicone resin must be catalysed before impregnation of the cloth, a typical catalyst being triethanolamine for resin DC 2103 added in the proportion of 0·3% to 0·5%.

The resin-treated, dried cloth is cut to desired size, assembled for thickness and pressed under hydraulic pressure with the necessary heat conditions. For example Phenolic and Melamine resins need about 1,000 lb/sq in. at 150° C. Silicones require conditions of 180° C. and 1,000 lb/sq in. followed by several hours stoving at temperatures increasing from 180 to 250° C in order to obtain complete curing and to develop the optimum properties.

Spraying the binder on the preform



Properties

The table below gives a comparison of properties between the three main types of Fibreglass laminates, and it can be seen that from the electrical viewpoint the silicone bonded type has outstanding electrical characteristics. These figures were taken from tests on $\frac{1}{8}$ in. thick samples.

Thus Phenolic and Melamine bonded laminates are suitable for Class B Insulation, while Silicone-bonded falls into Class H. The Phenolic bonded types can be used for such applications as slot wedges for motors and alternators, end winding supporting pieces and so on. The Melamine group is of importance due to its physical strength, resistance to arcing and chemical resistance. It also has the virtue that under intense heat it does not give off toxic fumes. For the Silicone bonded types the main applications, at the moment, lie in the high temperature and high frequency fields of electrical engineering. As the material is still under active investigation and is not generally

TABLE 1. GENERAL ELECTRIC PROPERTIES OF FIBREGLASS LAMINATES

PROPERTY	PHENOLIC	MELAMINE	SILICONE
Power factor at 1 megacycle ...	0·06	0·08	0·002
Electric strength (V/mil)	150-200	150-200	250-300
Laminae breakdowns (kV/in.) ...	15-20	10-15	50
Insulation resistance, dry—megohms	10,000	20,000	500,000
After immersion in water—megohms	10	10	10,000
Water absorption—mgms	40	20	5-10
Tensile strength—lb/sq in.	20-25,000	20-25,000	15-20,000
Shear strength—lb/sq in.	20-25,000	15,000	14,000
Impact: Flat—ft/lb	5·0	6·3	5·6
Edge—ft/lb	2·0	1·8	2·0
Effective temperature resistance ...	150° C	150° C	250° C

TABLE 2. MEASUREMENT OF P.F. CHANGE ON EXPOSURE TO 250° C

NO. OF DAYS	P.F. AT 50 C/S	P.F. AT 1,000 C/S
As produced	0·009	0·0011
3	0·003	0·0009
7	0·0016	0·0008
14	0·002	0·0007
17	0·0016	0·0007
21	0·0018	0·0007
Electric strength at end of cycle—240 V/mil.		
Laminae breakdown at end of cycle—60 kV/in.		
Tensile strength—13-16,000 lb/sq in.		
Shear strength at end of cycle—13-14,000 lb/sq in.		

TABLE 3. INSULATION RESISTANCE UNDER CONTINUOUS EXPOSURE TO 100% RH

TIME	RESISTANCE
Days	*Megohms*
7	300,000
14	110,000
62	80,000
70	75,000
85	45,000

TABLE 4. POWER FACTOR CHANGE ON EXPOSURE TO MOISTURE

CONDITION	POWER FACTOR AT 1,000 c/s
As produced	0·0006
After 24 hours at 100% RH and 40° C	0·0091
After 24 hours in water at 25° C ...	0·0127

available in bulk, its exact position in the insulating materials group has not yet been established.

Other properties of Silicone impregnated glass laminates are given in Tables 2, 3 and 4.

Machining

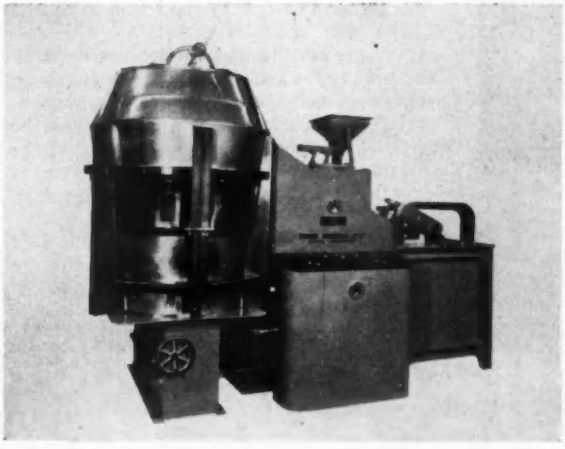
The machining of Fibreglass laminates, in common with most other plastic materials requires care. It is recommended that tungsten carbide dipped tools should be used, and that cutting edges should be kept very sharp and dust extraction plant provided to remove the particles. Recent experiments carried out using a ceramic tipped tool have been most satisfactory and there appears to be a considerable future in this field. The Silicone laminates can now be produced in thicknesses from 0·004 in. upwards, and up to $\frac{1}{8}$ in. thick the sheets can be easily punched to form intricate shapes.

Other Fibreglass Uses

Apart from the electrical applications, Fibreglass based plastics have many other uses. At Messrs. Ashdowns Ltd., Eccleston Works, St. Helens, Lancs, where much of the development work has been carried out, we were recently able to see such items as miners' helmets, translucent corrugated roofing, fishing rods, colanders, trays, refrigerator doors, and so on being made. In the latter items a technique similar to that used in the making of felt hats was employed, the fibre being chopped into short lengths and then sucked by air over a grating of the required shape. A resin was then sprayed on, sticking the fibres together and this "preform" pressed in the usual manner.

"Undulite" translucent corrugated sheet using Fibreglass mat

The manufacture of the preform is carried out in a Turner Atherton machine, the first to be made in this country. As can be seen from the photograph reproduced below, the "chopper" is on the right of the machine and the shaped perforated grating is in the large chamber on the left. In order to ensure an even thickness of material, the base of the chamber on which the grating is mounted can be both rotated and tilted. The quantity of fibres admitted to the chamber is controlled by an electric timing mechanism which is accurate to within 5%. After the preform has been sprayed with the binding emulsion, it is baked for a short time in an oven to bond together the glass fibres, and after treatment can be lifted from the screen for normal handling.



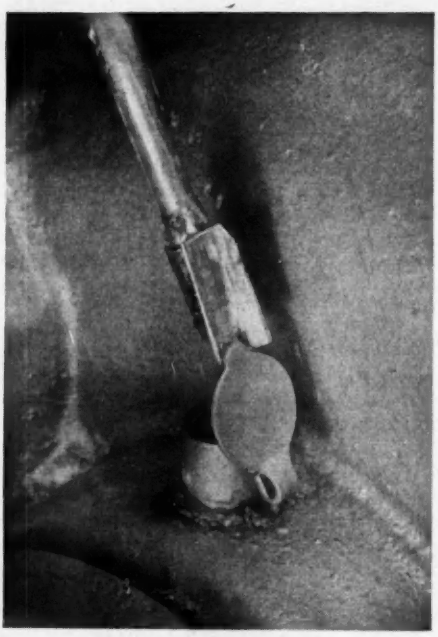
Turner Atherton automatic machine for preforming Fibreglass

PROBLEMS AND PRACTICE in Engineering

Lubricator Cap Lifter

ANYONE who has to make regular rounds with the oil can in order to lubricate sleeve bearing motors and the like, will have experienced the exasperating nature of the spring-closed oil cup lid. If the lubricator is awkwardly placed, one tries to lift the lid by means of the tip of the oil can spout because there is only sufficient room to admit this. The spring-closed lid snaps back, just when the oil can spout is about to be inserted in the oil cup.

A positive lifting device for oil cup lids comprises a small piece of brass strip about $\frac{1}{2}$ in.



The oil filler in operation

long and $\frac{1}{4}$ in. wide and bent to a shallow V-shape. This is soldered to the oil can spout, as shown in the illustration, and engages with the lid of the lubricator. The lid can be lifted without the fear of the spout slipping sideways and the lid snapping shut.

It can be seen that the delivery end of the spout is placed perfectly for shooting oil into the cup while the lid is held open.—*C. T. Bower.*

Phasing In

FACED with the problem of phasing in two delta-star transformers supplied from two independent h.v. systems, engineers found that irrespective of the changes made in the h.v. and l.v. connections it was impossible to operate the transformers in parallel. By suitable choice of connections it is always possible to parallel delta-star units (assuming, of course, that the other necessary conditions are fulfilled) provided only that the h.v. systems are either in phase, or out of phase by a multiple of 60°. It follows that in this case the angle between the systems cannot be 0°, 60°, 120°, and so on.

A simple method of determining this angle is to explore the potential differences among the l.v. terminals of the two transformers until the smallest p.d. is found. It can be shown that the smallest angle between the two systems, say φ, is given by :

$$2.\sin\varphi/2 = r = \frac{\text{smallest p.d. between terminals}}{\text{phase to neutral voltage}}$$

$$= 130/250 = 0.52 \text{ in our example.}$$

An easy calculation gives $\varphi = 30°$ from which we infer that one of the h.v. systems has an additional stage of transformation which introduces a $\pm 30°$ phase shift, e.g., a delta-star, or star-delta.

For a 60° shift the value of $r = 2.\sin\varphi/2$ is unity, and for zero shift the value is zero. Collecting these results, we can summarise the practical application as follows :

(1) Explore the p.d.'s to find the smallest.

(2) Divide this p.d. by the phase to neutral voltage. Call this result r.

(3) If r is zero the transformers can be paralleled as they stand, but not necessarily in accordance with the l.v. terminal markings.

(4) If r is unity the transformers can be paralleled after changing over any two of the h.v. connections of either transformer.

(5) If r is not unity or zero they cannot be paralleled.

(6) If r is about 0.5 a Group 1 or 2 (B.S. 171) transformer may be substituted for one of the delta-star units for parallel operation.—*J.G.B.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Back-Pressure for Chemicals

NEW I.C.I. PLANT PROVIDES IDEAL CONDITIONS FOR STEAM-ELECTRIC GENERATION

CONCENTRATION in one site of nine large chemical plants provides a coincidence of process steam and heat demands that offers nearly ideal conditions for the operation of pass-out and back-pressure turbines. This situation has occurred at the Wilton Works of Imperial Chemical Industries, Ltd., and the company has taken full advantage of it. We were privileged recently to inspect the power station that has been erected to provide the required steam with a generating capacity of about 60 MW.

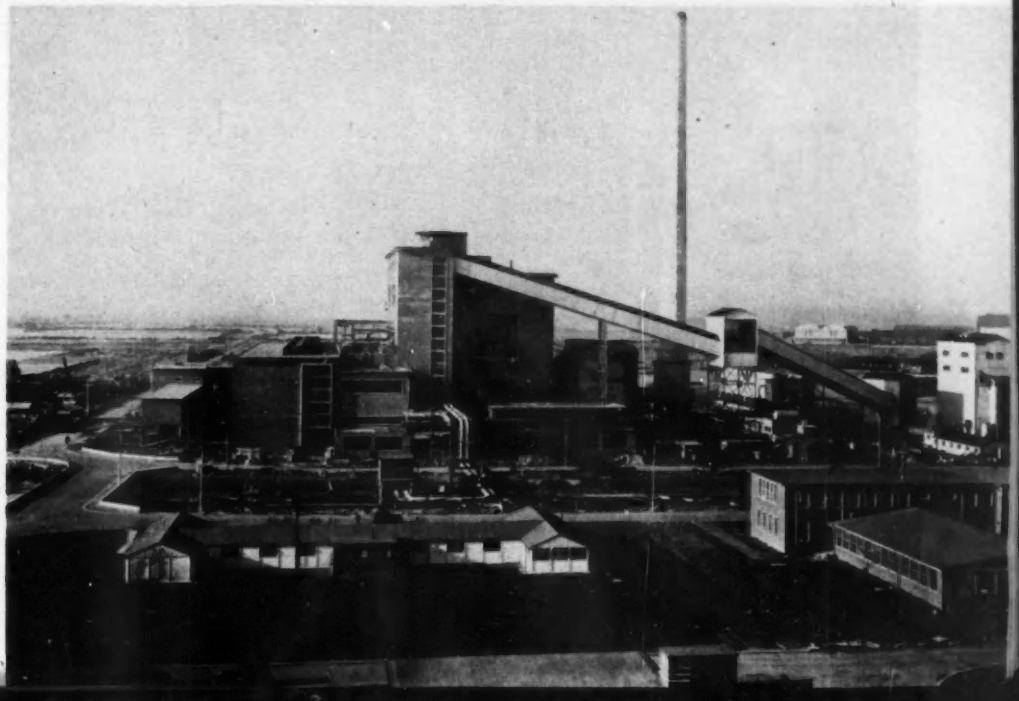
Position

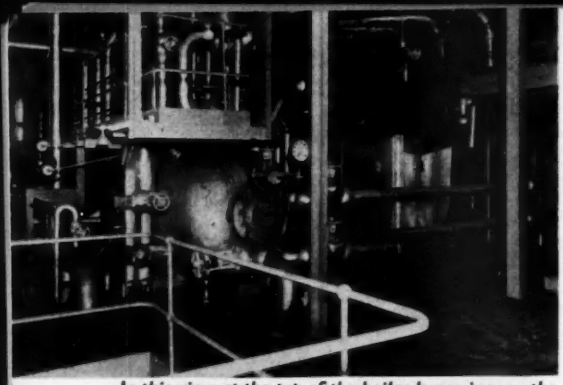
The Wilton site lies between Redcar and Middlesbrough, about two miles from the sea and from the River Tees. Extending to some 2,000 acres, it will provide space for many of the plants planned in the company's development programme. Its usefulness is increased by a 9-ft diameter tunnel, 1,750 ft long, which joins the Wilton site to the I.C.I. Works at Billingham, running 100 ft below the River Tees. In this tunnel runs a series of pipes which enable intermediate products to be exchanged between the two groups of works.

All the plants at Wilton require steam and electric supplies, and two steam pressures were decided upon as the best for the chemical processes involved. For the evaporation of organic liquids, 250 lb/sq in. was selected; for the evaporation of water—and also for space heating—20 lb/sq in. When the desirability of using the same steam to drive turbines was considered, it was concluded that 900 lb/sq in., 900° F were economic conditions at the turbine stop valve.

For steam generation Babcock and Wilcox high-head boilers are used, each with a capacity of 265 klb/hr. Steam is passed at 900 lb/sq in., 900° F to Metropolitan-Vickers back-pressure turbines, in which it is expanded to 250 lb/sq in., 640° F. Some of the steam is passed to the factory mains, and distributed round the

Here the station is seen from the east end. Control room and switch house are left, then turbine house auxiliaries bay, boiler house and precipitators. Services distribution trenches are seen in front of the station





In this view at the top of the boiler house is seen the high pressure boiler drum and its fittings

works, the remainder is taken to Metropolitan-Vickers pass-out turbines working down to 20 lb/sq in. Most of the steam at this pressure is passed to the works, but condensers are installed which can handle nearly half of the steam entering the turbines.

In addition to the main high-pressure boilers, two oil-fired boilers, each of 132 klb/hr capacity, are available. These generate steam at 250 lb/sq in., 640° F, and they were put in initially to provide steam on site before the main boilers were available. They are now used as a stand-by for occasions when the main boilers are out of operation.

Electricity is generated by alternators of various ratings from 23·5 MW to 8·3 MW. They feed into station busbars at 11 kV and these are also connected to the public supply by 11 kV/66 kV transformers. According to the balance of steam and electricity demands at Wilton, energy is either imported from or exported to the N.E.E.B. system.

Power Station

The power station is sited near the centre of the works, occupying a site which gives good facilities for future extension. This position is also convenient for the main service network of the works. Shallow trenches run crosswise over the site, carrying the many pipes which are a typical feature of the large chemical works. Distribution cables are run on concrete sleepers in these trenches, and taken off by means of cable bridges or otherwise to individual buildings. The power station stands near the convergence of the main trenches.

In general plan, the power station follows conventional lines. In the view of the partly finished station which we reproduce, it is seen from its eastern end; the intention is to extend it westwards. From south to north the sections are switch house and control room; a 55-ft turbine bay with a 40-ft auxiliary bay; a 98-ft wide boiler house; and another 98-ft wide section comprising cyclones, precipitators and the 300-ft high stack. One of the main service trenches can be seen in front of the station.

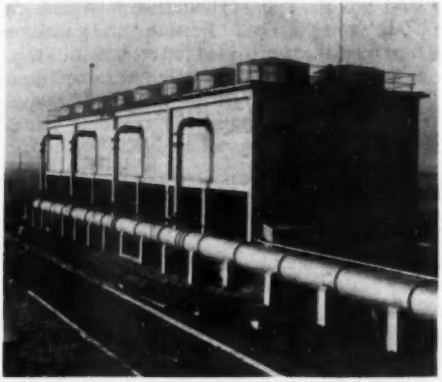
In the design of the station, considerable use was made of models. The large amount of

The 265 klb/hr boilers seen here are arranged for oil, gas or pulverised fuel firing. A soot-blowing panel is seen in the centre of the picture, the main boiler control panel being extreme left

high-pressure steam pipework in the station has to be laid out so as to give ample flexibility. By placing auxiliaries in the necessary bends of 15-in. steam mains, it has proved possible to save some 10 ft of width on the station.

Boiler House

At present two boilers are installed in the station. These are the Babcock and Wilcox high-head type, and the leading particulars of their design are given in Table 1. These boilers are designed to burn coal, oil or gas. Coal is the usual fuel, and it normally consists mostly of a deep-mined 11,000 B.T.U./lb unwashed smalls from the Durham coalfields, although

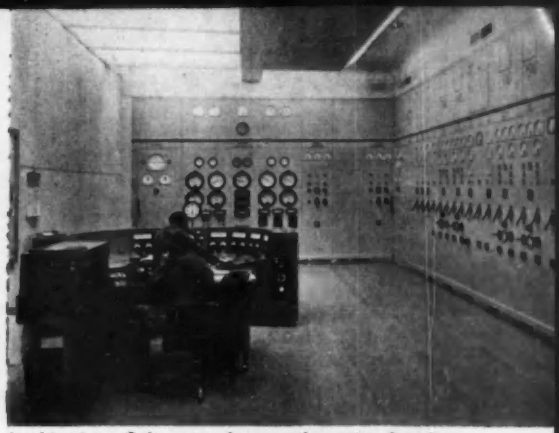


Cooling towers are fan type, each contains 16 cells. A 42-in. diameter main connects the main station

some open-cast has to be taken. Oil is used for lighting up the furnaces, and is available as the result of the installation of the 132 klb/hr oil-fired boilers already mentioned. Gas comes into the picture because it is produced in the factory's olefine plant. Normally it is used in subsequent chemical processes, but any disturbance in working conditions may result in a surplus which is most economically used in the power station furnaces.

B. and W. E type mills, three to a boiler, are used for firing. Each is rated at 13,500 lb/hr, and two together can supply 90% of the full load requirements of a boiler. Primary air is supplied by James Howden fans. Intake fans draw their air supplies from the top of the boiler house, a baffle being provided to prevent cold air being drawn-in from the boiler house window lights.

Control of final steam temperature is provided by 2-in. tubular attemperators, drawing their cooling medium from the furnace side walls. The boilers as a whole are controlled



In this view of the control room, the main electric control panel is seen on the right. Steam and electric auxiliaries fault enunciators are provided on the control desk as well as governor controls

from conventional boards housing a range of recording and indicating instruments. From the nature of chemical plant operation, the steam demand is largely constant, a factor which eases operational requirements.

Only about half the condensed steam is returned to the power station feed tank, and so a quantity of make-up water is required. This is obtained by conditioning drinkable water supplied by the Tees Valley Water Board. A Permutit demineralisation plant having a rating of 23,200 gallon/hr. is used to treat the water before it enters the boiler feed tank. All the feed water is then fed to a degassing tower to remove CO_2, is heated, and is then fed to Hick Hargreaves' de-aerators. It is then treated again by continuous dosing with caustic soda, sodium sulphate and sodium sulphite. After another heating stage, it is pumped to the boiler drum, where it is intermittently dosed with disodium phosphate and tannin.

Ash and Dust

Dust extraction from the boiler flue gases is achieved by means of 16 Buell cyclone separators, followed by a Sturtevant electrostatic precipitator. Babcock and Wilcox hydro-jet ashing plant is used, and sluiceways run to the west end of the station from the boiler, cyclone and precipitator hoppers. Ash is pumped from a sump there along an 8 in. pipeline, to lagoons, where it is allowed to settle out. It is used for land reclamation.

Turbine House

Table 2 gives the leading details of the turbines installed at present. All are Metropolitan-Vickers sets, and they stand in-line with the steam ends of individual sets together. As will be seen from the table, there are two sizes of set at present installed, but the steam conditions are common to both. The primary

On the left of this general view of the auxiliaries bay is seen the main 3·3 kV switchboard. Boiler feed pumps are in the foreground

turbine of each pair of turbo-alternators consists effectively of the h.p. cylinder of a standard 60 MW, 900 lb/sq in., 900° F set. Steam that is not taken away to the i.p. mains (250 lb/sq in., 640° F) passes to the secondary turbine, which is a two-cylinder unit. Steam is exhausted from the first (i.p.) cylinder at 20 lb/sq in., 300° F, and the greater part of it is taken away to the factory. The remainder (up to about one-third) can be further expanded in a l.p. cylinder, which is provided with a condenser and is rated for working at 28·5 in. mercury vacuum at the turbine exhaust. In operation, the boiler house responsibility is to maintain the primary t.s.v. pressure at 900 lb/sq in. The electrical control room then adjusts the primary turbine governor setting to a position that gives a 250 lb/sq in. pressure at the exhaust of this turbine, when reckoned in conjunction with the factory demand for steam.

To permit steam supply to be continued when any turbo-alternator sets are out of action, reducing valves and desuperheaters are provided across both the primary turbines and the l.p. cylinder of the secondary turbines. Three primary desuperheaters are installed, each capable of breaking down 264 klb/hr of 900 lb/sq in., 900° F steam to 253 lb/sq in., 640° F. High-pressure pipelines all come into steam receivers mounted on the auxiliary bay roof. From these receivers also run lines to boiler and to turbine, and cross-over pipes to the second boiler receiver and reducing valves.

Feed Heaters and Pumps

There are seven stages of feed heating associated with each pair of turbo-alternators. First comes a boiler blow-down heat exchanger, and this is followed by two stages of gland steam heating associated with the primary turbo-alternator. These stages affect only the make-up water coming from the water-treatment plant. Next comes a heater fed with steam bled from the l.p. cylinders, and then the de-aerators. These are operated with steam at 20 lb/sq in., and three are installed (one spare), each having a rating of 600 klb/hr.

There follows a bled-steam heater associated with i.p. cylinder and a final i.p. heater taking steam at the i.p. cylinder input pressure (250 lb/sq in.). Feed heating and turbine gauge boards are provided for each pair of sets.

Two stages of feed pumping are employed. First, there is a lift pump, which comes between the de-aerator and the i.p. bled steam heater. There are three such units, with electric drives, and one with steam, and they deliver at 375 lb/sq in., 242° F. Electrically driven pumps are rated at 300 klb/hr, and the steam-turbine-driven unit at 450 klb/hr.

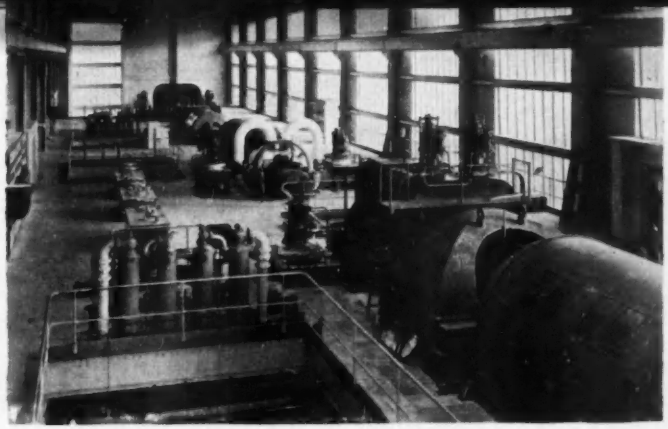
Boiler feed pumps, which follow the final i.p. steam heaters, deliver 300 klb/hr each of water at 392° F against a pressure of 1,205 lb/sq in. Again, there are three electrically and one steam-driven pump. All pumps are by Mather and Platt, Ltd., and both lift and feed pumps are installed in line at the rear of the turbine house, with de-aerators and i.p. feed heaters in front of them.

TABLE I.—TECHNICAL DETAILS OF BOILERS

Rating	klb/hr	265
Feed water—economiser inlet	lb/sq in.	1,125
—economiser inlet	°F	388
—economiser outlet	°F	498
Steam—stop valve	lb/sq in.	950
—stop valve	°F	950
Boiler heating surface ...	sq ft	4,620
Furnace heating surface ...	sq ft	3,290
Combustion chamber volume	c ft	16,500
Heat release rate	B.T.U./c ft/hr	21,500
Coal, av. cal. value	B.T.U./lb	11,000
Bunker capacity	tons	600

TABLE II.—TECHNICAL DETAILS OF TURBO-ALTERNATORS

Set No.		1 Pri.	1 Sec.	2 Pri.	2 Sec.
Pressure—t.s.v.	lb/sq in.	900	247	900	247
Temperature—t.s.v. ...	°F	900	640	900	640
Speed	r.p.m.	3,000	3,000	3,000	3,000
Inlet steam rate ...	klb/hr	265	154-198	530	308-396
Exhaust pressure (pri. & i.p.)	lb/sq in.	253	20	253	20
Alternator rating—m.e.r., 0·8 p.f.	MW	8·3	11·4	17·5	23·5
Condenser capacity ...	klb/hr	—	66-88	—	132-176
Feed heat system—rating	klb/hr	—	291	—	582
Feed heat system—delivery temp.	°F	—	394	—	394



Nearest the camera in this turbine-house view is No. 2 primary set. Next to it is No. 1 secondary, with No. 1 primary in the distance

Fan-type cooling towers of the type developed by I.C.I. are installed. These are supplied by Film Cooling Towers, Ltd., and have a capacity of 924,000 gallon/hr. The cooling towers are sited at the north side of the station, and are connected to the condensers by a 42 in. diameter main.

Electrical Connections

All the alternators (see Table II) generate at 11·5 kV, and feed through 750 MVA Reyrolle double busbars o.c.b.s (type A3T). The switch house is at the southern end of the station, and it houses as well as the switchgear, reactors and the station battery.

The main busbar is broken into two sections, connected by a reactor giving 75% impedance on 30 MVA. Each section is connected to the two alternators of one set, and to the N.E.E.B. 66 kV network. Two 15 MVA star/delta connected Parsons transformers provide this latter link. From this 11 kV busbar, supplies are taken, through further reactors and o.c.b.s, to works substations. The reactors in one case are 6% on 20 MVA, but this varies according to the circumstances. Works substations are in general unattended, and have no 11 kV switchgear.

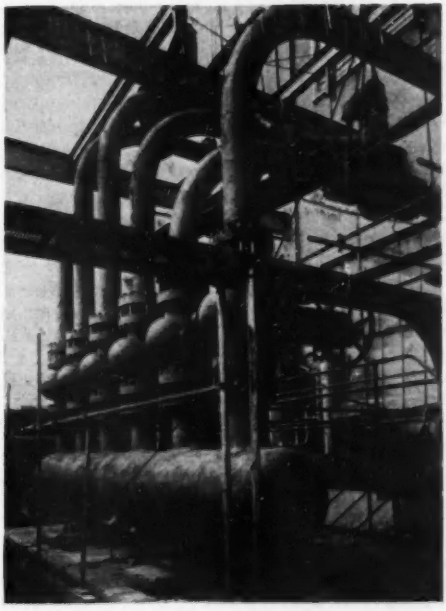
Station power requirements are supplied through two 11 kV/3·3 kV Parsons transformers rated at 5 MVA each. These are connected one to each half of the main 11 kV busbar, and they supply two separate switchboards situated along the north wall of the turbine house at operating floor level. The switchgear at this voltage has all been supplied by the English Electric Co., and is of the air-break type, rated at 150 MVA. Feed pumps and other large auxiliaries are fed directly from this board, direct-on starting being employed. All the motors in the station are by Mather and Platt.

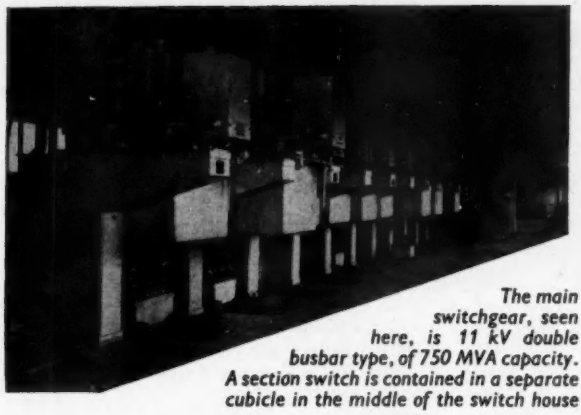
Boiler auxiliary boards are run at 415 V, three Lindley-Thompson transformers of 1 MVA reducing the voltage. The main boiler house board operating at this voltage has Metropolitan-Vickers air-break switchgear, but the distribution boards which are fed from it are equipped with Parmiter Hope and Sugden fusegear. Turbine house arrangements are generally similar, except that the supply is given through two 500 kVA transformers. Motor starters at 415 V oil-break (George Ellison) in industry situations and contactor elsewhere. Above 35 h.p. Brookhirst starters are used, with Allen West below.

Installation

All high-power supplies are run in p.i.l.c.s.w.a. cables, run in standard style. For other supplies, p.v.c. has been in general preferred to rubber as the cable insulant, with Pyrotenax where conditions are hot and in switch houses, etc. Most of the lighting in the plant is fluorescent. Alternate fittings are, as far as possible, fed from either side of the main busbars, and with this duplicate supply arranged, it has been thought permissible to

Steam receivers on the auxiliary bay roof are the focus of interconnecting pipework





The main switchgear, seen here, is 11 kV double busbar type, of 750 MVA capacity. A section switch is contained in a separate cubicle in the middle of the switch house

keep the amount of tungsten emergency lighting provided on the low side. In the boiler house, considerable ingenuity has been exercised in mounting the lighting fittings in accessible positions.

Earthing proved comparatively simple on the site. Four 8 ft and twelve 12 ft copper rods have been driven, and an earth strip is run round the station. Alternator neutrals can be connected to the earthing system through Reyrolle type "C" switchgear, via a Metropolitan-Vickers 1,500 amp liquid resistor.

A mechanical rectifier is, as usual, installed to supply the Sturtevant precipitators, and this is supplied by a 50 kVA B.T.H. transformer. The station batteries are by Chloride, and there are two of them. First comes a 600 amp/hr, 110 V installation for switchgear and emergency lighting supplies, and secondly there is a 120 amp/hr 50 V supply for the house telephone switchboard. Cycloc chargers are used, with a Hewittic mercury-arc rectifier for quick charging.

Future

At present, a third h.p. boiler of similar design and capacity to the existing ones, is on order. This, when completed, will mean that enough steam is available to feed all the turbines. The present electric connections make provision for two new sections to be added to the main busbars, of up to 40 MW each. After this a separate system may be adopted.

The control room offers evidence of this intention to extend. It is at present divided down the centre of its ultimate position, as is apparent from the photograph we reproduce. As the station is at present operated, the control engineer remotely controls all turbine governors to maintain the primary turbine exhaust pressure at 250 lb/sq in.

FUEL FOR HOUSES

LAST week discussion on a "Fuel Policy for Housing" drew a crowded audience to hear the merits of solid fuel, gas and electricity put by representatives from each industry. Held at the Housing Centre, the conference was under the chairmanship of Lord Ridley, who in his opening remarks re-stressed the little real difference in value between the three fuels.

Speaking in defence of solid fuel's contribution to domestic fuel policy, Mr. Bellingham, of the Coal Utilisation Council, admitted right at the start that there was a natural demand for electricity in every home, and continued by considering the proposed utility solid-fuel fire, which he thought useful but doubted whether it would be popular with housewives, and as insufficient supplies of smokeless fuel were available the way to domestic bliss lay in the manufacture of efficient bituminous coal-burning appliances. But better thermal insulation for houses would make all the difference whatever fuel was used.

In defence of gas Mr. Holliday, manager of Watson House, reminded his audience that the gas industry was really responsible for efficient solid-fuel appliances—by providing coke. He concurred with the N.C.B. recommendations that solid fuel should be used for main space and winter water heating, gas being used for all other services.

For electricity Mr. Dale (E.D.A.) commented that despite the fact that electricity was synonymous with civilised living, they would cede the use of one solid-fuel appliance for continuous winter space heating, all other services being provided efficiently, conveniently and cleanly by electricity, especially for the two million housewives with two occupations. He asked his audience to consider the effects of the recent fog, or rather the 16 tons of dirt and sulphur dioxide in every cubic mile of London's atmosphere. Only the open fire was to blame. There was general commiseration with his sad reflection regretting that more of this dirt was not burnt in power stations.

WIRING FOR MUSIC

—*Electrical Installation in London's Festival Hall is described in I.E.E. Paper*

CLOSE co-operation between architect and electrical engineer is necessary for success in the erection of any large public building. When the building and its requirements for electrical services are as complicated as the L.C.C.'s Royal Festival Hall, and when building has to be completed within two years from initial design, it is apparent that this early planning must be extremely detailed. Some interesting decisions to which it gave rise are described by MR. J. G. HUNTER, ASSOCIATE I.E.E. (London County Council), in a paper which he presented to the I.E.E. Utilisation Section last Thursday, under the title "The Royal Festival Hall: Electrical Installation."

To appreciate the background to the problems involved, it is necessary to realise that the auditorium of the hall rests in a cradle formed by the main structure. This is to keep out external sounds, and to this end the auditorium walls are provided with a cavity. Bridges for doors and service ducts crossing this cavity are kept to the minimum number possible.

Sub-Distribution

Lateral sub-distribution mains are, because of this complexity, provided at a low level, and in general provided by 12 6-in. cable ducts. There is a rising cable duct near each corner of the building, and these four ducts are provided with a switch room at each level. The ducts are divided to keep B.B.C. and telephone cables spaced away from power cables which might cause interference. Cables from the electricity board substation some distance away on the river side of the Hall terminate in a main switch room at ground level in the river front of the building.

Throughout the building, space is at a premium. The reinforced concrete construction adopted affects especially the ceiling heights of switch rooms, and the problem was further complicated in the planning stage because it was not permissible to cut beams *in situ*. In consequence, all cable-ways through beams, floors and walls had to be planned in time for incorporation in the structural scheme.

Cubicle type l.v. switchgear is installed, with the requirement that such switchgear shall have 12 in. of free space at the base, after the manner of a feeder-pillar root. With this arrangement, the switchgear and cables have been installed on concrete floor slab, a wood floor being built afterwards on brick piers, and sectionalised for easy access to cables. As a result of this technique, inverted cable-sealing cables have been largely avoided and installation much facilitated.

Drained cables are installed in the vertical cable-runs, and here and elsewhere unserved steel wire armouring is employed to protect p.i.l.c. cables against mechanical damage. Whipping wire wound round the armouring proved generally successful in preventing "bird-caging" where cables were taken round bends though it was sometimes stripped off in the process.

Power cabling to various parts of the building is v.r.i. installed in screwed conduit and distribution boards are provided with h.r.c. fuses. For general purposes, 13-amp socket-outlets with associated fused plugs are used, with sex sockets on a 7/·036 in. circuit. Ring circuiting is used in a few positions only. In the boiler house m.i.c.c. cables are used.

Lighting supplies are similarly run in v.r.i., except for the boiler house. Heavy-gauge screwed welded conduit is usual, with steel trunking applied to good effect where large concentrations of cable circuits occur. It was necessary to install the lighting conduits before the type of lighting and the fittings had been decided upon. The difficulty of locating the outlets from conduits has in most cases been overcome by installing the conduits to the approximately correct positions and then making connections from those points by means of metal-armoured flexible cables.

Switch Economy

Another economical adaptation adopted in the lighting circuits is the use of 30-amp double-pole micro-gap switches connected as two single-pole switches, so halving the number of switches required.

The extensive lighting arrangements present many novel features which cannot be noted here. It is of interest, however, that the maximum intensity of auditorium illumination

attainable is 50-60 lumens/sq ft. For concerts, experience shows that a level of 25-35 lumens/sq ft is more suitable. To avoid wasting energy in the dimmers, a satisfactory intensity of 40 lumens/sq ft is obtained by substituting 230-V lamps for the normal 250-V lamps used.

Resistance dimmers are employed, partly because saturable-choke and thyratron systems were in an early stage of development in 1948. Special consideration was given to the cold-cathode section of the lighting installation. Finally a system was chosen whereby circuits of eight tubes were dimmed using one resistive dimmer and two transformers. Auxiliary capacitors are installed to correct the power factor on normal load, and these are automatically cut out of circuit as the power factor becomes more leading as dimming proceeds.

DISCUSSION

MR. E. JACOBI (Troughton and Young) suggested that the Festival Hall, as the first building of its kind to be erected in this country for some 14 years, showed great advances in some electrical features, such as the lighting and the switchgear, but few in installation practice. He queried the connections between the transformer chamber and the Hall, suggesting that single copper bars could have been run in trunking with considerable saving in costs. Within the building, he felt that a ring main between ground floor switchrooms would have increased diversity. He would have preferred flexible conduit to flexible metal cables for the lighting points.

MR. FORBES JACKSON (L.C.C.), recalled that time shortage was a most serious factor in the building of the Hall, and necessitated the closest collaboration between architects and engineers.

MR. W. SEDDON (Manchester Corporation) commented in detail on many of the points raised in the paper. He especially liked the generous provision of ducts for future use, and welcomed the evidence of co-operation in siting the lateral ducts. He thought that the necessarily extensive provision for sub-metering was likely to cause trouble, and to cramp distribution right through. D.P. microgap switches for single-pole use he deprecated; but he thought that nothing had replaced conduit for wiring with advantage.

MR. S. L. M. BARLOW (Barlow and Young), suggested that it was general to sub-divide the general lighting rather than keep it in one main group. He also queried the use of single fittings for both primary and secondary lighting. In some cases of difficult cable runs to cramped lighting positions, he thought that m.i.c.c. might have been used to advantage.

MR. P. MCKEARNEY (Ministry of Works), after an admission of the relative case of being wise after the event, suggested that by more careful consideration of design and diversity, more economical transformers might have been used. The use of mainly unscored cables he took as confirmation of his view, that if cables could be got safely into position, mechanical protection was unnecessary. Money might thus be saved by a little less rush in the installation stage. He appreciated the use of trunking, which was a valuable economy, but he queried the use of the d.p. microgap switches from the point of voltage between poles.

MR. J. W. J. LESLIE (Barlow and Leslie), attacked the use of h.r.c. fuses in the lighting circuit which he thought extravagant and usually unnecessary from considerations of fault current. He suggested also that the lighting installation gave an extravagantly high level of illumination.

MR. C. DYKES BROWN (G.E.C.), looked forward to the time when artificial lighting would always be considered as important as the positioning of windows. Special care was taken at the Festival Hall to reduce to a minimum specular reflections and high brightness contrasts.

MR. F. P. BENTHAM (Strand Electric) referred to the subtle colour effects achieved in the Hall lighting. With reference to dimmers, he recommended the resistance type. It was a well tried, reliable and versatile tool, which was very useful and practical for a large installation, especially one in which lights were for most of the time either full-on or full-off.

MR. R. O. ACKERLEY (G.E.C.) said that in recent years the word "decorative" had been misused in lighting to convey the idea of decorative fittings. The modern conception of good lighting was not confined, as it had been some years ago, to getting a certain amount of illumination on the "working plane," but involved building up the correct brightness pattern of the whole interior. What the author described as "decorative lighting" was the lighting used to build up that essential pattern, and it did so extraordinarily well.

MR. C. KING referred to the unpredictable nature of lightning, and to the fact that so little was known about it that the installation engineer, in designing a protective system, was not much better off than his predecessors. It was important, however, to provide a low impedance path to earth, to have ample cross-sectional area in the down conductors and to eliminate bends. This was a serious problem with reinforced concrete buildings, because otherwise flashovers, arcs and so on could cause material damage to the fabric of the building.

THE AUTHOR, replying to questions, said that the maximum demand to date was about 600 kVA, and occurred in the summer, when ballet was in progress. He agreed with what Mr. King had said about lightning protection. The steel reinforcement of the concrete was not welded together. The I.E.E. regulations and British standards had been observed throughout.

18 DECEMBER, 1952

Meat and Machinery

Livestock and farming equipment at Earls Court for SMITHFIELD SHOW

THE introduction in a much wider range of machinery and electrical equipment in farming has helped generally to bridge the former wide gap between the agricultural and industrial communities. Most certainly today for economic and other reasons the townsman takes a much greater interest in his farming contemporary. The countryman has responded to this interest and today we have the phenomenon of some areas of the Metropolis going truly rural for short periods during the year.

At Earls Court last week it was the Smithfield Show which brought the country to town once again. This show, however, was unique in the large amount of electrically powered equipment which was displayed.

The machinery section on the ground floor had many examples of equipment for the preparation of grain and different types of fodder which relied on electricity for power.

This was the theme to which E.D.A.'s stand was entirely devoted. A full-size silo allied to a 60-ton plant was fitted with a fan and heater unit by J. L. Gandley and Co. Ltd. Another section had a platform drier with a G.E.C. fan and heater unit, whilst an electrically operated winnower by Cooch and Sons was fed by a Michigan elevator. Also on E.D.A.'s stand were Marconi and Kaybee (an infra-red unit by T. R. Walker) meters for the determination of moisture content.

Grain and Grass Drying

New grain and grass driers were featured by Alvan-Blanch Development Co., who also displayed a portable electric forge for the repair of machinery and implements.

Penney and Porter Ltd., well-known Lincoln engineers, displayed their new Mk. 1 "Lincoln" all-electric grain drier and the new "Lincoln" winnower. Lainchbury and Sons Ltd. showed a new "Convoy" grain conveyor which, robust yet simple in construction, required only 1¾ h.p. to move 5 tons per hour horizontally; they also showed their bin ventilator, which is a new design of blower for blowing hot air through grain brought into store from the combine harvester in order to dry it.

Mitchell Colman and Co. Ltd. displayed a new MC tornado suction attachment which is powered by a 10 h.p. motor and is coupled to the standard type M Tornado portable grain blower of the firm. In addition there was Dryvent grain drying and storing equipment.

Geo. W. King had a new sack hoist, which is a development of the MyTeMin electric chain pulley block, with a capacity of 280 lb and a rate of 75 ft per minute.

In the display of T. R. Walker there was a wealth of electrically powered equipment. The Kaybee gravity separator, powered by a 10 h.p. totally enclosed motor; the research and garden seed plant, powered by a 2½ h.p. Brook motor; Kaybee Type K hammer mill, arranged for direct drive through a self-aligning coupling from a 30 h.p. Brook R.16 motor. This unit is for grinding dried grass, cereals and pulses. When working on grass it has a capacity of 7/8 cwt per hour. Other equipment included the Scientaire pneumatic pre-cleaner and the Kaybee infra-red moisture testers using 150 W infra-red lamps.

Power Units

A new "Z3" 5 kVA, 230 V, single-phase generator set coupled to a 7 b.h.p. diesel engine featured by Bamfords Ltd., of Uttoxeter, incorporated remote starting, whilst Dale Electric's B/4/DX generating plant was claimed to be the most inexpensive 4 kW semi-automatic generating plant on the market. Arthur Lyons presented a new lightweight (1,500 W) battery charging and lighting set for 12/24 V.

Other new introductions included display cabinets for butchers by Frigidaire and Prestcold—the latter included a double-duty 6 ft and two 4 ft general-purpose display cases with Presmetic hermetic unit, and a 6 ft Panorma display counter—and the mobile N.C.B. electric butcher's shop featured by Smiths Electric Vehicles Ltd.

The Importance of *CONSTANT SPEED DRIVES*

Vibrating Switch Control gives close regulation

By WORKS ENGINEER

MAKERS of motion-picture projectors, calculators, dental laboratory equipment are amongst users of machines which require close regulation. In many of these applications motor speeds must be held constant, in spite of changes of load and voltage.

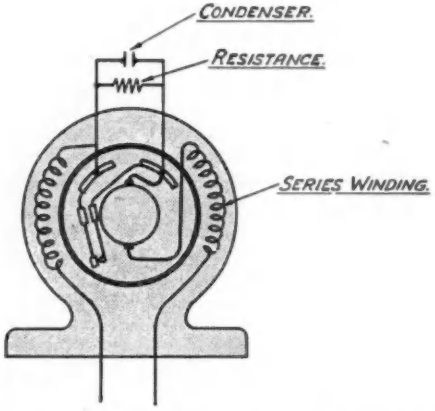
The inclusion of a governor or contactor controller in the design of a plain series or repulsion type of motor not only changes radically the ordinary performance characteristics, but enables considerable reduction to be made in the size and weight of the motor for a given output. Conversely, much more power can be obtained from a given size of motor over a pre-determined speed range. In addition, it is possible to provide for adjustment of the speed of the motor over a wide range and for speed selection even whilst the motor runs.

Switch Conditions

When a simple make and break centrifugally operated switch is fixed to the shaft of a plain series motor, and the switch contacts connected in series with the motor circuit, two conditions may exist. Firstly, with the switch contacts closed the circuit is normal, and when the current is applied the motor will accelerate in the usual manner. When a speed is reached sufficient to operate the centrifugal switch the contacts of the latter will open and the second condition will obtain. As a result of this break in the series circuit there is then no current through the motor. The speed will therefore fall off to the point where the centrifugal switch closes the contacts, thus restoring full-line voltage to the motor. If the cycle of operation of the governor be repeated with great rapidity, the motor speed will be held within a maximum and minimum speed, depending on the sensitivity of the governor.

Speed regulation within very close limits will result if, instead of a complete interruption of energy to the motor, the current is only partially interrupted. This may be accomplished by the provision of a resistance connected across the contacts of the governor. When the contacts are closed the circuit is a normal series circuit, and the motor tends to accelerate accordingly. When the contacts however are open, the resistance is put into circuit in series with the motor. The current through the motor is thus limited, depending upon the particular value of the resistance, and the motor tends to lose speed. By selection of the proper size of resistor in the governor, smooth performance at particular running speeds for a given loading can be obtained.

Electrical connections from the motor circuit to the governor are made through suitable brushes and slip rings.



Circuit illustrating the connections for close-limit speed regulation. The capacitor absorbs the inductive surge

Governors are constructed of a moulded bakelite disc, a steel hub insert and a hard commutator copper slip-ring set. A special insulating disc is provided between the Bakelite disc and the copper in order to eliminate the possibility of shooting resulting from the carbonisation of the bakelite compound at the gap between the slip rings. Contact points are mounted on copper radiators which ensure the dissipation of heat produced by the slight resistance of the oxide film on the contacts.

The amount of heat so produced is a limiting factor as regards the ampere-carrying capacity of the governor.

As has been mentioned previously, the governor contacts make and break rapidly. This is due in part to the centrifugal action following slight changes in motor speed; but the very high frequency of interruption that is responsible for the extreme accuracy of speed regulation is independent of the motor speed, and is determined by the natural periodic frequency of the spring which carries the moving contact. This contact vibration is maintained by the slight explosive effect of the minute spark that occurs between the contact surfaces at each interruption, throwing the moving arm periodically away from the stationary contact. Oscillograph records have confirmed this and show interruption frequencies of approximately 200 per second. The higher frequency enables the satisfaction of the exacting requirements of the sound-motion picture applications of the governor-controlled motor.

Increased Output

As the speed of series motors of the conventional type varies widely with the load, according to the characteristics of this type of motor, it has been necessary in the past to employ high-resistance windings to limit the speed of the motor and to prevent the armature from speeding up to destruction under light-load conditions. It has been necessary to keep the no-load speed as high as possible, in order that the motor when under load will still rotate at a fairly high speed after slowing down to develop the necessary torque. With a governor included, all speeds are so limited by the circuit-breaking mechanism that motor windings may be provided of much lower resistance and can consequently carry much heavier currents. This in turn gives a greater output. For continuously rated motors, the windings may be from 10% to 20% lower in resistance, and about 40% lower for intermittently rated machines.

Ordinarily a motor designed to operate with governor control will have sufficient power to carry the intended load at higher speed than that at which it is to operate with a normal load. Thus, when the current in the motor is reduced by the governor acting to include resistance in the circuit, the torque will be sufficient to maintain the given loading. Further considerations relative to the design of the motor windings have reference to the necessity for keeping the inductance of the motor at a minimum, since this factor has a direct bearing on the life of the governor contacts.

Standard designs of governors are used on both series and repulsion types of motors. Two general styles are available. One is adjustable while the motor is stationary, the adjustment consisting merely in turning a set screw to move the stationary contact closer to or farther away from the moving contact. The other style is so arranged that a stationary contact can be adjusted whilst the motor is running.

When it is desired to control direct-current motors or convertors by regulation of the field current, an "inverted" design of governor is used. In such cases the governor contacts close with increase of speed, thereby cutting out a field resistor. When direct current is used, a split slip ring is used in the motor. The purpose of this is to prevent polarisation of the contacts and so avoid consequent roughening and eventual sticking. The split slip ring reverses the current each revolution and so supplies alternating current to the contacts.

Contactor governors will not operate satisfactorily on all series wound motors, since certain structural characteristics have a bearing on the performance. For example, an odd number of segments in the armature causes excessive armature vibration and "bearing chatter" at low speeds. In general, however, a motor that will operate quietly at low speeds and full load is best for governor control. If noise is present it becomes more objectionable through the high-frequency interruption of the line, thus setting up a "growl." Whilst this is hardly perceptible in a properly designed series motor, it is less likely to be apparent in a motor of the series repulsion type.

Speed and Regulation

Contactor governors can be designed to operate at speeds from 800 r.p.m. to 8,000 r.p.m., and stationary adjustment types permit a variation of approximately 10% above or below normal speed.

For sound-recording or reproduction apparatus, the motor speed should be between 3,600 and 4,500 r.p.m. to obtain the best governor operation. Good regulation means a speed held within $\frac{1}{4}$ of 1% with a voltage variation of 10% (about). It is possible to design both motor and governor to obtain $\frac{1}{10}$ of 1%.

From the foregoing remarks it is evident that when the governor principle is applied in the design of a motor, such a motor is treated individually, having definite characteristics that suit it for performance under particular load and speed conditions. It is therefore imperative that machine designers and motor manufacturers should have full and complete knowledge of torque-speed-time demand of the machine which the motor is to drive.

Rheostatic Braking for Trolleybuses

OWING to the free running nature of the trolleybus, it was found in the early days of their introduction that excessive brake wear was taking place. It was obvious that this could be reduced by using electrical machine braking, using the driving motor as a generator and feeding the power back either into the line (regeneration) or dissipating it as heat in resistance banks (rheostatic). As far as the first method was concerned, it was found that regeneration as far as the average driver utilised it, was of limited advantage from an energy-saving viewpoint, and could also cause trouble if the power was sent back to a non-receptive line without special absorption equipment. For some time, therefore, the majority of equipments have employed rheostatic braking without regeneration.

In the majority of equipments, compound-wound motors have been used, and in most cases both fields were used for motoring, while the separately excited field was used as the prime excitation for the rheostatic brake. In some cases this field was used alone, in others it was associated with a few turns of the series field as inverse compounding, and in others it was associated with the braking resistors (starting resistors used as such) so that a form of inverse compounding characteristic was obtained.

Fig. 1 indicates the approximate performance of these systems. These, however, suffer from the fact that changes in motor field winding temperature cause considerable variation in braking effort. Further the torque limit fixed for the transmission must not be exceeded and this has the inevitable result that the "hot" braking is not as good as it might be.

A New Scheme

A new system developed by G.E.C. uses a section of the series winding for braking excitation, associated with the motor braking voltage. This is shown schematically in Fig. 2. The power circuits are so arranged that only a portion of the series field winding remains in circuit, and the current flow relative to the armature is reversed. The braking circuit then is formed through the armature, the resistor B and the series winding C. The regulating shunt winding "S" is energised in series with the motor armature across the line. Thus, when the voltage of the armature "M" is high, at high speed braking the armature voltage will exceed line voltage and provide inverse excitation. At low speeds the excitation will be cumulative due to the line voltage exceeding the armature voltage. This gives a more constant tractive effort curve (Fig. 3), and there is little difference in torque between the hot and the cold state.

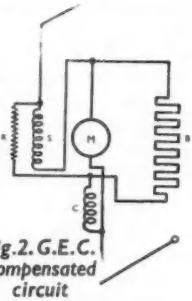
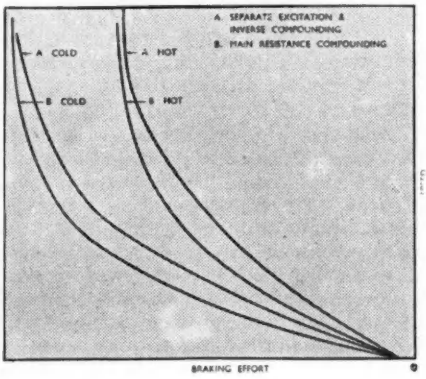


Fig. 2. G.E.C. compensated circuit



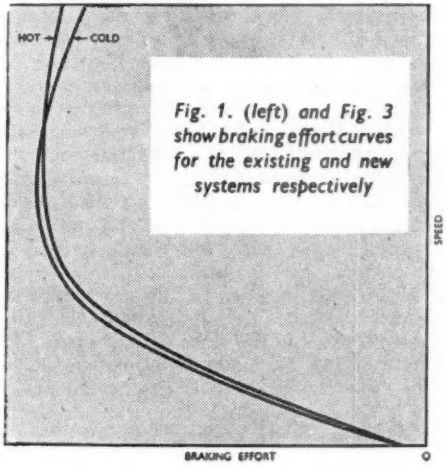


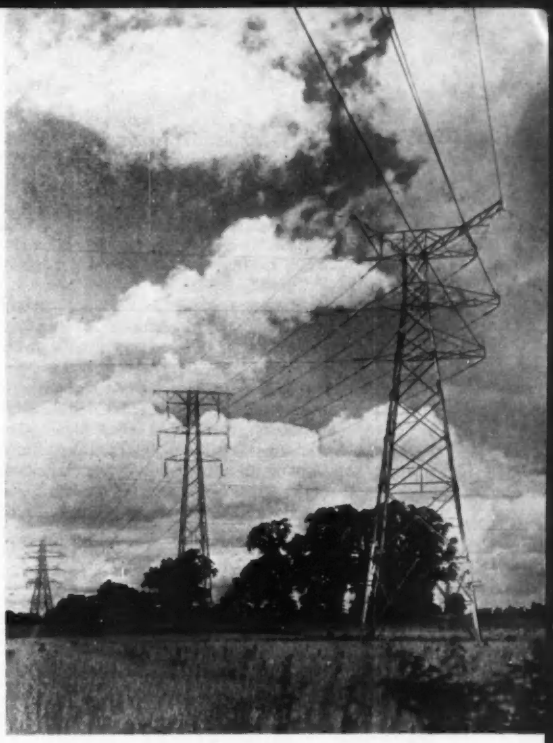
Fig. 1. (left) and Fig. 3 show braking effort curves for the existing and new systems respectively

RYE HOUSE CONNECTED

Extension to 132 kV Grid in Eastern Division

AN important extension to the 132 kV transmission system has recently been completed, connecting Rye House power station to the grid. The work was a co-operative effort between the B.E.A. and W. T. Henley's Telegraph Works Co., the latter attending to constructional design and carrying out all field work. Responsibility for design and execution of the work was taken by the Authority's H.Q. and Eastern Division engineering staff.

Using 0·4 sq in. equivalent copper conductors, the extension is a 132 kV double-circuit, steel-tower line, 24 miles long, running from Rye House to a new substation at Tollgate Wood, near Hatfield, and thence to an existing 132 kV double-circuit line at Watford, passing, near Elstree, the site of a future 275 kV substation. Steel towers are of normal Blaw-Knox standard design for 132 kV lines, but to cope with these heavier conductors necessitated a reduction in the basic span and restricting the maximum working tension to that used for 0·175 sq in. conductors.



The line as it passes at Elstree the site for the 275 kV substation. Note the terminal tower in the rear for possible extensions in the future

Several difficulties were encountered in constructing the line, of which one was the task of crossing existing power lines belonging to the Eastern Electricity Board which could not be taken out of service. In this case, structures of steel scaffolding were erected to carry the conductors over the energised lines. Further provision was required for the proposed 275 kV substation at Elstree. Apart from deviations to by-pass the site, the line had also to be carried, at the same place, over an existing 132 kV line which was to be re-orientated for connection to the new line.

Near Watford the new line approaches another existing double-circuit 132 kV line to which it is to be looped in. This will be accomplished by using a terminal tower on the new line, from which conductors are to be passed, by means of two pairs of gantries, under the existing line, to rise obliquely to a special junction tower erected, between the gantry crossings, on the centre line of the existing double-circuit line. We are indebted to Mr. W. N. C. Clinch, controller, Eastern Division, B.E.A., for the information given in this article.

Left is shown the line crossing the main Midland Region line near Radlett. Cables will replace the communication lines beneath the power lines

overseas news

Grid for Alberta ?

Calgary Power Ltd. is negotiating with the Consolidated Mining and Smelting Co. of Canada Ltd. to obtain power from West Kootenay to relieve a shortage in Alberta, it is reported. The Alberta firm proposes to build a 190 kV transmission line from Kimberley to its Elk River line. It also is reported that there is a possibility that this connection between Calgary Power and the West Kootenay source may be extended in the future to set up a grid system. This system would encompass Consolidated Mining and Smelting Co. facilities, Grand Coulee, the B.C. Power Co. and British Columbia Power Commission facilities, as well as the present grid system in Alberta, it is stated.

British Plant in Canada

A representative of C. A. Parsons of Canada Ltd. is in Lethbridge, Alberta, to supervise the installation of the new Parsons generator in the city's power station. Recently received from Newcastle-on-Tyne, the 5,000 kW generator will cost the city about $270,000, including installation and accessory expenses. It is expected that the set will be in operation by the end of the winter. It will not increase the capacity of the power plant until steam can be supplied from the $400,000 boiler which is expected to be installed by mid-1954. Till that time it will act as a standby.

Seaway—Another Step

In Toronto it is learned that the U.S. Federal Power Commission's engineering staff have approved the New York State's plan to assist Canada to construct the large hydro-electric power project on the St. Lawrence River. The approval was contained in a report issued in advance of a Commission hearing which opened last week into New York's application for a licence to join with Canada in the project.

Rural Work

Confronted by the high cost of extensions to power lines, farmers in Alberta have banded together to form small organisations to make a joint effort in local territories. From these has been formed the Union of Rural Electrical Associations in Alberta which recently held a two-day convention. At this, Mr. M. D. Shields, chairman of the local committee for the area south of Calgary, said the average cost of installing an electrical system was well over $1,000 per farm, while on a mile basis, the cost was about $1,300 per farm. He said the recently announced Government policy which was expected to operate shortly would reduce the initial cost to the farmer. Under this, if 50% of the farmers in a district signed up, then the Government would guarantee the association's loan for the project from the Government for only 50%, but as the percentage of farms signing increased, so would the guarantee.

Contract Bid

The English Electric Co., Ltd., is in the news again—this time in connection with its offer to supply four 60 MW generators for the Chief Joseph dam at Bridgeport, Washington, U.S.A., at a price of £1,570,000, the lowest tender price quoted, it is stated. The next lowest tender was that of the Westinghouse Electric Corporation at £1,770,000, followed by General Electric at just under £1,890,000. The Chief Joseph dam is a Federal project—being carried out on the Columbia River by the U.S. Army Corps of Engineers, and the tenders are for the second stage of construction. The contract for the first four sets was given to the Westinghouse Co. last May. The project, which will have an ultimate capacity of 1,728 MW, will be the second largest power scheme in the world, it is claimed. The English Electric Co. also put in an offer of £247,000 for the supply of transformers to the Seattle city electricity undertaking. This has been accepted. See page 1135.

Poland's Development

Assembly of a second generator at the Miechowice steam power station—one of the largest stations of its kind in Poland—was completed in the record time of four months, it is reported. A third set is to undergo trials shortly. The Miechowice power station has been designed to burn low-quality coal, which is transported via a funicular railway from neighbouring mines. The station is one of several being constructed under the six-year plan, ending 1955, which are estimated to add 2,620 MW of plant capacity. The construction of one of the largest Polish thermo-power stations, Jaworzno II, is also considerably advanced. In the next five-year plan (1956-60), Poland will begin the construction of large hydro-electric power works on the Vistula and the Bug, which will enable electrification of the country's backward areas.

Projects in Greece

Projects under way in the Greek electrification programme include the thermo-electric plant at Aliveri and hydro-electric plants at Lhadon, Agra and Louros, according to a progress report submitted by the Public Power Corporation to the Minister of Industry. The Aliveri plant, with an output of 80,000 kW, will go into operation in April, 1953, starting with one turbine. Two

months later a second will commence operation. The Lhadon hydro-electric plant should be operating on one turbine—giving an output of 25,000 kW by the end of 1953—while a second turbine of the same output will go into service early in 1954. The Agra plant will have an output of 40,000 kW to meet Macedonian requirements; half the installation will be in operation by the end of 1953 and the other half early in 1954. The smaller Louros plant will be supplying 5,000 kW to Epirus from the end of 1953 onwards. Of the total amount of $237 million budgeted for the electrification programme, $118 million have already been spent. The next projects suggested are a hydro-electric project at Acheloo (output 180,000 kW) and a thermo-electric project at Ptolemais (40,000 kW).

Butler's Gorge Opening

At the naming of Australia's largest single-arch concrete dam and official opening of the Butlers Gorge power station a few days ago, the speakers emphasised the cheapness of electricity in Tasmania compared with other states. The opening of the power station was performed by the Premier, Mr. Cosgrove, while the Chief Justice, Sir John Morris, unveiled a plaque at the dam. At the switching on ceremony, Mr. Cosgrove said although the station was small (15,000 h.p.), it would provide a most useful addition to the system. The new type of machine had been working satisfactorily in the station, and a similar type would be installed at the new Tungatinah power station.

Rural Subsidy

It was not yet possible to indicate what policy the State Government would adopt in dealing with raising the subsidy limit on rural electricity extensions, Mr. V. J. F. Brain, chairman of the Electricity Authority of New South Wales, stated recently. Mr. Brain said while there had been a steady increase in costs since the inception of the scheme, the capital cost per consumer, averaged over all applications received during the past 12 months, had been less than £250. As the immediate objectives of the present scheme would soon be reached, the question of the next stage of development was receiving attention. The question of raising the present subsidy limit was under consideration. The aim of extending electricity supply as widely as possible into rural areas had of necessity been guided by funds available for the purpose.

Diesels for N.S.W.

Five supercharged diesel engines would be generating power at the State Dockyard, Newcastle, New South Wales, this month, Mr. H. G. Conde, chairman of the Electricity Commission of N.S.W., said recently. He said they would add 5,000 kW to the Commission's interconnected system. Mr. Conde purchased the plant when he visited the United States in 1951. The five engines are mounted on a reinforced concrete foundation. Their total cost was about £350,000.

Cable Tenders

Identical quotations from 11 out of 14 tenderers to supply the Christchurch (N.Z.) Electricity Department with 9,600 yd of armoured cable drew the eye of Councillor T. H. McCombs when the City Council met recently. The 11 tenderers all quoted £32,454, the other three quotations being £33,657 16s. 3d., £33,927 and £34,448. There was nearly unanimity, too, in tenders for 9,600 yd of pilot cable, in which case seven out of eleven tenderers quoted £3,313 10s. The other four tenders were lower. Councillor McCombs commented that it looked as if there was a ring dealing in the supply of electrical equipment. New Zealand had experienced similar things before when dealing with manufacturers in the United Kingdom, and it looked as if they put their heads together and charged what the traffic would stand, he alleged. But Councillor A. R. Guthrey did not see anything sinister in it and suggested that unfair accusations should not be made without knowing all the facts. An amendment that the tenders be referred back to the Electricity Committee was lost, the tenders recommended by the Committee for acceptance being approved.

Overhead or Underground?

The question of placing distribution lines above or below ground has again been discussed by the Christchurch (N.Z.) City Council. This particular instance referred to a supply to the Spreydon housing estate. The Electricity Committee reported that it felt that no useful purpose would be served in putting the cables underground if the Post Office and Telegraph Department was unable to do likewise. Also, it expected the Housing Committee to pay the difference between o.h. and underground lines. Mr. J. C. Forsyth, engineer-manager of the Electricity Department stated, that the comparative costs were £1,484 for overhead and £6,650 for underground using lead sheathed cable or £5,624 with aluminium sheathed. The capital costs per consumer would be £20 18s., £81 2s. and £68 12s. respectively. Mr. Forsyth went on to state that because of serious corrosion of aluminium sheathing he was reluctant to recommend its use. The department was making tests to determine the effect of various Christchurch soils on the cable sheathing. During the discussion many of the councillors supported the idea of underground cables and it was agreed that the Housing Committee (which had already recommended using o.h. lines) should investigate the possibility of placing the extra cost of the former on to the development costs.

Christchurch Expansion

To support capital expenditure of £262,000 planned by the Christchurch (N.Z.) Electricity Department for the year 1953-54, the City Council is to revive the unspent balance of a loan authorised in 1940, ammounting to £90,000. It was estimated that in the year 1953-54, £172,000 would be available from the department's own resources, but it would be necessary to find another £90,000.

PERSONALITIES IN THE INDUSTRY

Mr. I. A. A. Macdonald, manager of the Leamington and Warwick District of the East Midlands Electricity Board, has been appointed manager of the Ilkeston District, which was extended to include Long Eaton in the reorganisation which took place in April 1951. He will take up his new duties early in the New Year. Mr. Macdonald, who was educated at Bedford School, joined the Derbyshire and Nottinghamshire Electric Power Co. in 1927 and was appointed manager of an associated company of the Midesco Counties Group, the Midland Electric Light and Power Co. Ltd., in 1938. Since vesting date he has been manager of the Leamington and Warwick District of the Board.

Mr. I. A. A. Macdonald

Formerly with the Export Sales department of R. A. Lister (Marine Sales) Ltd., **Mr. H. N. Norbury,** has joined Henry Meadows Ltd. as their sales manager. He will be responsible for the home and overseas sales.

Kerry's (Great Britain) Ltd., announce the following new appointments in their organisation which take effect from January 1 next. **Mr. E. E. Kerry,** Northern area manager, is appointed branch manager, Stratford. **Mr. W. H. Poole,** assistant branch manager, Sheffield, is to be branch manager, Sheffield; **Mr. D. A. Scott,** now deputy branch manager, Perivale, will become branch manager, Perivale; **Mr. E. Timms,** sales supervisor, Leicester, is appointed branch manager Leicester; **Mr. S. W. Hines,** London sales supervisor, becomes branch manager, Middlesbrough, in place of **Mr. J. F. P. Morrill,** who has resigned from that position; **Mr. R. M. Binch,** warehouse manager, Leicester is to be warehouse manager, Sheffield; **Mr. J. C. Timmins,** warehouse manager Cambridge, is appointed warehouse manager, Leicester; and **Mr. R. N. Pool,** assistant warehouse manager, Leicester, is to be warehouse manager, Cambridge.

Mr. D. G. Hawkins has been appointed general manager of the National Gas and Oil Engine Co. Ltd. He is already a member of that company's board. He joined the Brush Electrical Engineering Co. in 1945, and after holding various executive positions went to Petters Ltd. as sales director in June, 1949. In November, 1951, he joined J. and H. McLaren Ltd., where he was concerned with the reorganisation of the factory's products.

Mr. J. Birkbeck, A.I.R.I., has taken up his appointment as production manager with Brynmawr Rubber Ltd. He was founder chairman of the Burton-on-Trent section of the Institution of the Rubber Industry.

Fellowship of the Illuminating Engineering Society has been awarded to **Mr. W. E. Rawson-Bottom** and **Dr. L. Knopp,** Ph.D. Mr. Rawson-Bottom is with the Ministry of Works in London and is well known for his work in connection with the lighting of museums and art galleries. Dr. Knopp is technical adviser to the Cinematograph Exhibitors' Association on lighting and projection in cinemas.

Sir Percy Lister, chairman of R. A. Lister and Co., Ltd., has announced that his board which at the moment consists of four brothers and himself have invited **Mr. M. I. Prichard, Mr. F. E. Blackstone** and **Mr. C. D. MacQuaide** to be assistant directors to the board of the parent company. These appointments are subject to confirmation by the shareholders at the annual general meeting early next year. The three new directors have been selected from the executive staff of the group.

Fifty years service with Gent & Co., Ltd. by **Mr. E. Pulman** was celebrated recently with a luncheon party at which he was presented with a cheque by **Mr. Kelvin Parsons,** managing director of the firm. Mr. Pulman joined the company in September 1902 since when most of his time has been spent in wiring and installing electric clock and telephone systems (including many in prominent public buildings) and in attendance at the trade counter in London.

Mr. Parsons, left, presents a cheque to Mr. Pulman

Mr. H. Copping, M.I.E.E., who recently resigned from the position of general home sales manager of Newman Industries Ltd., sailed for Toronto, Canada, in R.M.S. *Caronia* last week. Mr. Copping is now associated with the Electric Construction Co. Ltd. and British Overseas Engineering and Construction Corporation Ltd.

Mr. H. Copping

Ekco-Ensign Electric Ltd. have appointed **Mr. L. H. Lamb** as their representative for various eastern postal districts of London and adjacent part of Essex.

Mr. D. C. Thomson has been appointed director of welfare to the British Electricity Authority. He will have under his charge education, training and safety as well as welfare and will also be responsible for the joint consultation machinery. A native of Edinburgh, educated at Edinburgh Academy and Edinburgh and Oxford Universities, he graduated M.A., and later, at Oxford, B.A. In 1926 he was appointed senior official of the B.B.C. in Scotland and later held the post of director of the Scottish Region until his resignation in 1933. From 1940 to 1942, following several years in journalism and publishing, he was staff personnel officer of Lewis's, Ltd., of Manchester and Birmingham. Between 1942 and 1944 he was chairman of the Hanley Manpower Board and from 1946 to 1949 chief education officer to Richard Thomas and Baldwins, Ltd. Since 1949 until his resignation earlier this year, he was one of H.M. Inspectors in Further Education for the Metropolitan Division covering Management Studies, Middlesex.

After ten years as area engineer at Middlesbrough for the G.P.O., **Major A. C. Pitcairn,** B.SC.(ENG.), M.I.E.E., is to take up a similar appointment at Southampton.

A presentation has been made to **Mr. C. J. Bullock,** assistant district engineer at Crook (Co. Durham) for the North Eastern Electricity Board, to mark his impending retirement after 39 years service. On behalf of the staff, Mr. N. Blackett, district engineer, presented Mr. Bullock with a wallet and books.

A. C. Morrison (Engineers), Ltd., have appointed **Mr. S. A. Buchan,** operating from 88 Pittodrie Place, Aberdeen, as their representative in Scotland.

Dr. E. D. Adrian, O.M., has been elected president of the Royal Society for the ensuing year, with **Sir Thomas Merton** as treasurer and vice-president, and **Sir Edward Salisbury,** C.B.E., and **Sir David Brunt** as secretaries and vice-presidents.

The council of the Institute of Fuel has agreed to award the Melchett Medal for 1953 to **Dr. Harold Hartley,** C.B.E., "In recognition of his high scientific attainment in the development of domestic heating appliances coupled with the administrative skill with which he has guided a great industrial organisation devoted to the practical efficient use of fuel." Dr. Hartley is chairman of Radiation Ltd.

OBITUARY

Mr. N. Brooksbank, M.I.E.E., who was chief London engineer to the Victoria Falls and Transvaal Power Co., for 23 years, died on December 5. After that company was taken over by the Electricity Supply Commission of South Africa in 1948, Mr. Brooksbank carried on a consulting engineer's practice in London.

An authority on telephone and telegraph cable systems, **Mr. P. E. Erikson,** M.I.E.E., FEL.AMER.I.E.E., a member of the International Standard Electric Corporation, died in Sweden on December 7, aged 72. Trained in Stockholm he joined the Western Electric Co. of New York, and later came to London, being placed in charge of the construction of the London-Birmingham cable, the first loaded long-distance cable installed in Europe. After being assistant European chief engineer of the International Western Electric Co., he became assistant vice-president of the International Standard Electric Corporation in 1928, and European chief engineer in 1930. Transferred to Sweden in 1940 to act as liaison officer between the New York office of that concern and the Scandinavian companies, he returned to the London headquarters as technical adviser to the European Commercial Dept. in 1946 and eventually retired in 1950.

Sir William Cecil Dampier, SC.D., F.R.S., died on December 11, aged 84. In latter years he had been closely associated with research and experimenting in agriculture, but in the earlier part of this century, following academic and laboratory education at Cambridge, he was author of a number of volumes including *Theory of Experimental Electricity* and *Solution and Electrolysis.*

Mr. W. F. Kent, contracts manager of the Marconi International Marine Communication Co. Ltd., The Radio Communication Co. Ltd. and the Marconi Sounding Device Co. Ltd., died on December 9.

Dr. F. C. Eve, M.D., F.R.C.P., who died on December 7, aged 81, was an authority on methods of artificial respiration. He evolved a new method of artificial respiration by rocking which is strongly advocated by many officials as being the best system to adopt in cases of treatment for electric shock.

Mr. R. G. Kilburne, O.B.E., M.I.E.E., who died at Taunton on December 9, aged 60, had been chief engineer to the Government of Nepal since 1926.

Mr. G. E. Smith, A.M.I.E.E., sub-area consumers' engineer in No. 6 sub-area of the North Western Electricity Board, died on November 27.

NEW LITERATURE

Electrical Instruments, Meters, and Electronic Control *edited by E. Molloy.*

THE sixth of this practical electrical engineering series under the general editorship of Mr. Molloy, this book is a comprehensive survey of measurement and its near relative process, control. Little attempt is made to theorise on the subjects under discussion, the various contributors having their feet firmly planted on practical applications throughout. As, however, this book is primarily intended for the operating engineer whose main concern is the accurate measurement and control of electrical plant or industrial processes, there is nothing lost by the insistence on practice before theory.

In the first of the twelve sections to this book, a general yet intimate survey of switchboard indicating instruments is presented before attempting to cope with the more intricate niceties of recording instruments. Two sections are devoted to supply meters and their testing in accordance with the Electricity Supply (Meters) Act, 1936, and later portable and the more specialised laboratory instruments are subjected to the same thorough inspection. As a prelude to electronic control, which occupies the last four sections, industrial uses of thermionic valves receive careful consideration and provide a suitable stepping-stone to a discussion of electronic motor control, finally turning to applications of light-sensitive cells and magnetic amplifiers. Published by Newnes, 196 pages, 9 in. by 6 in. Price 17s. 6d.

Direct Current Machines

by H. B. Ranson, B.SC.(ENG.), A.M.I.E.E.

AFTER a brief review of the elements of electromagnetic theory as they are applicable to the d.c. machine, the author of this book plunges into a rather breathless description of the construction of such machines, and of the basis of their design. Though this shock treatment may have its disadvantages initially, it does ensure that the reader is kept well aware of the practical restrictions that confine the subject he is studying. In this respect, it faithfully sets the tone for the whole volume. There follow more conventional chapters dealing with generation, armature reaction, and commutation and with the operational characteristics of d.c. motors and generators. All of these are well done, while that on armature reaction should prove specially helpful to the average engineering student. The accent on practical considerations, continued throughout the book, is again strongly in evidence in the final chapters, which deal with starters, speed control and motor enclosure in considerably more detail than is usual in a text book of this kind. In its final balance, the treatment is to be recommended, for it cannot fail to hold the interest of the student, and it faithfully clears up most of the puzzles it sets him *en route* by the time the last page is reached. Published by Cleaver-Hume Press as No. 2 in their "Electrical Series," 285 pages, 7 in. by 4¾ in. Price 10s. 6d.

Mechanical World Year Book—1953

LITTLE recommendation can be needed for this little handbook, which always presents a most helpful selection of information for a very modest cost. This year's edition seems as complete as ever, and one new section has been added—a concise discussion of spring design, contributed by Dr. W. R. Berry. Other special articles, which, like the many tables have been subject to revision, discuss patents, procedure, the gas turbine, fuels and lubricating oil, machine tools, pumps, boilers and other topics. Published by Emmott and Co., 31 King Street West, Manchester 3, 360 pages, 6 in. by 4 in. Sixty-sixth year of publication. Price 3s. 6d.

BOOKS RECEIVED

Tensors in Electrical Machine Theory, by W. J. Gibbs. Elementary theory and their applications via differential geometry. A B.T.H. staff "Advanced Engineering Textbook." Published by Chapman & Hall, 238 pages, 8½ in. by 5½ in. Price 30s.

Commercial A.C. Measurements, by G. W. Stubbings. Theory and practice of measurements, excluding construction of instruments. Published by Chapman & Hall, 377 pages, 8½ in. by 5½ in. Third edition price 50s.

Alternating Current Waveforms, by P. Kemp. Extensive consideration of the analysis, causes and properties of complex waves. Published by Chapman & Hall as Vol. I in their "Monographs on Electrical Engineering," 406 pages, 8½ in. by 5½ in. Second edition, price 50s.

Artificial Light and Photography, by G. D. Riack and L. H. Verbeck. Comprehensive treatise on the subject of lighting for photographs. Published by Cleaver-Hume Press for Philip's Technical Library, 360 pages, 7 in. by 11 in. Price 52s. 6d.

Guide to the Excess Profits Levy. Sets out in broad outline the operation of the levy, and explains the major provisions of the legislation by which it is enacted. Published by the Federation of British Industries, 21 Tothill Street, S.W.1. 31 pages, 8½ in. by 5½ in. Price 1s.

Grundzuge der Lichttechnik, by R. G. Weigel. A specialist's book on lighting and lighting techniques, covering many aspects of the subject, for lighting and installation engineers, architects, etc. Published, in German only, by Buchverlag W. Girardet, 211 pages. Price (linen bound) 18:20 D.M.

Major Faults on Power Systems, by A. G. Lyle. Causes and protection; one of the publishers' "Monographs on Electrical Engineering." Published by Chapman & Hall, 355 pages, 8½ in. by 5½ in. Price 45s.

The BUYER'S *Column*

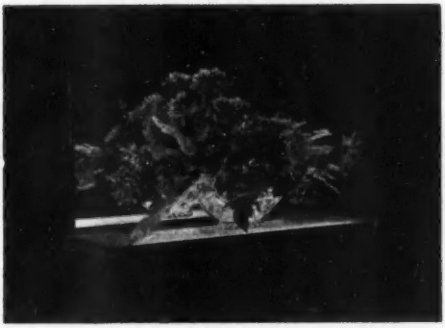
For Shop Window Displays

A NEW shop window reflector fitting recently introduced by CREASEY AND CO., 1/2 Regent Square, W.C.1, is illustrated above. This is constructed from wood and can be used for lighting a variety of products.

Illumination is provided by a 2ft 20W fluorescent tube, the light being thrown upwards through a frosted glass plate, the control gear for the fluorescent tube being housed within the unit.

Dimensions are 27½in. by 11in. by 3½in. and the unit is suitable for operation from a 200-250 V a.c. supply, the price being £5 5s., which includes the fluorescent tube. It is supplied with 3 yd of flexible cable. The mirror shown in the photograph can be supplied, if required, at an extra cost.

A smaller unit is also available which uses a



Brighten your window with a Creasey unit

284 mm 30 W striplite lamp for illumination, the price of this is £2 complete with lamp.

Corrosion-proof Torch Batteries

IT has just been announced by ALPHA ACCESSORIES LTD, Caemaur Factory, Treorchy, Glamorgan, that a limited supply of its "Ray-O-Vac" torch batteries can now be distributed to wholesalers throughout the country.

The "Ray-O-Vac" to be sold in Britain is entirely British made, and it offers many advantages to both retailer and public. The outer case, the top and the base are made of steel, which effectively prevents corrosion, chief bug-bear of long battery life.

"Ray-O-Vac" may be safely left in the torch as long as is wished, for every "Ray-O-Vac" battery carries a guarantee that should a flashlight be damaged by corrosion, leakage or swelling, the torch will be replaced.

Retailers will have noticed that there is no date line marked on these batteries. This, it is claimed, is unnecessary because, owing to their corrosion-proof properties, the batteries can be stored indefinitely without deteriorating in any way.

Polystyrene Capacitors

THE special characteristics of the new polystyrene capacitors, developed and manufactured by SUFLEX LTD., 35 Baker Street, London, W.1, will be of interest to designers in all the branches of the electronics industry.

Typical Suflex units

The remarkable insulation resistance of these capacitors, excellent stability and low power factor make them eminently suitable for the most critical applications.

Hitherto the low operating temperature of polystyrene capacitors has been a serious limitation. This is claimed to have been overcome by Suflex, who rate their capacitors at + 85° C for continuous operation, and have in fact been granted Type Approval by R.C.S.C. on their range to Joint Service Category 40/85 (−40° C +85° C).

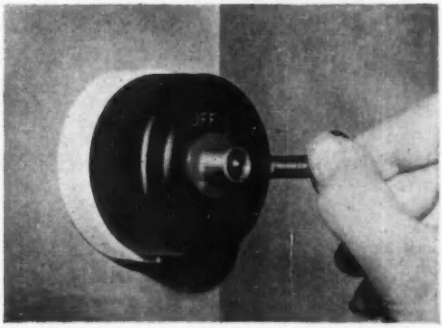
The present range at 500 V d.c. working covers 33 pf. to 4,700 pf. at tolerances of ±2% and ±10%. Some idea of the very modest space requirements of these capacitors is conveyed by the fact that the largest measures only 10 by 32 mm and the smallest 6 by 18 mm.

Key Operated Rotary Switches

TO meet the demand for rotary switches which can only be operated by authorised persons, TOK ELECTRICAL AND INDUSTRIAL MECHANISMS LTD., 2 Wadsworth Road, Perivale, announce the production of a range of key-operated "Tok" switches.

These are available in 5, 10 and 20 amp capacities for voltages up to 600 d.c. or a.c. Over fifty different switching sequences are available in each size.

Tok's new rotary key-operated switch



Protecting Wet Surfaces

THE introduction of "Glopane Wet," a new type of Glopane cold galvanising, specially designed for application *to wet iron or steel surfaces or even actually under water*, has been announced by CORROSION LTD., 16 Gloucester Place, Portman Square, W.1.

"Glopane Wet" has been subjected to prolonged laboratory and practical tests to ensure that it retains all the outstanding anti-corrosion properties for which zinc-rich paints are now well known. These trials have been highly successful.

"Glopane Wet" will be found invaluable for a number of specialised applications where it is not normally possible to secure a dry surface. Examples are—iron and steel structures partly submerged in tidal waters, built-in caves or otherwise underground in a consistently humid atmosphere, breweries, cold stores, laundries, paper-making mills, chemical works, ships' topsides and superstructures.

Apart from specialised applications, "Glopane Wet" will have perhaps an even greater importance as a time and money saver in the general building and civil engineering industries. Normally, it is necessary to allow a lengthy period to elapse after wet weather to allow the surface to dry off before painting can be begun or continued.

NEW RANGE OF INDUSTRIAL SWITCHGEAR

A CONSIDERABLE advance in switchgear design is in evidence in the new range of "Regent" gear introduced by SIMPLEX ELECTRIC CO. LTD., of Oldbury, Birmingham.

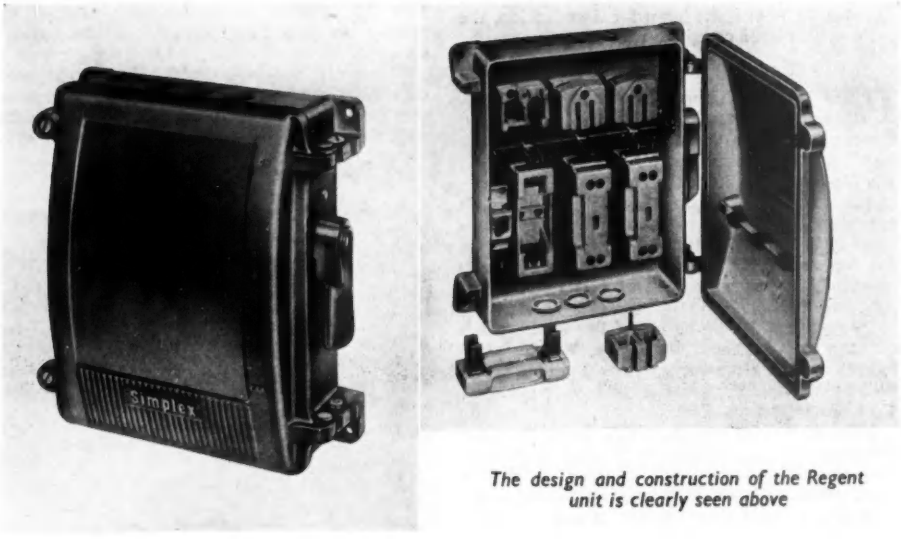
This new range of 15/30-amp, 500 V switches and switchfuses is the result of many years spent in the manufacture and practical application of this type of apparatus. Outstanding features are cleanness of design and maximum wiring space which provides easy accessibility.

The 15/30-amp, 500 V range of switches and switchfuses—60/100-amp, 500 V "Regent" gear will be available shortly—comprises single-pole and neutral (switchfuses only), double-pole, double-pole and neutral, triple-pole, triple and neutral, and four-pole. In the case of switchfuses a link is not fitted. This allows the minimum number of joints to exist in the neutral wire.

The case is strongly made in grey cast-iron and, as will be seen, the external lines are pleasing. Consistent with mechanical requirements, the number of projections and dust traps have been reduced to a minimum. The cover has a double groove carrying an efficient plastic packing. The boxes are normally drilled with clearance holes but thickened ends, either tapped as required or left plain for customer's use, can be supplied.

The switchfuses are normally supplied with rewireable fuse carriers, but h.r.c. fuse carriers can be fitted at any time when required. H.r.c. fuse cartridges comply with BSS.88/1947. In the case of the switchfuse, the switch bar is placed centrally to allow for easy manipulation of the cables and the switch bases are above the fuses, thus suiting the average incoming position better than the traditional arrangement. The neutral base consists of a porcelain shrouded block with one incoming and outgoing terminal.

The standard finish is "Silvex." Alternative finishes—black enamel, light battleship grey and galvanised are available, the last two mentioned at an extra charge.



The design and construction of the Regent unit is clearly seen above

Fire Extinction by Methyl Bromide

APPROXIMATELY ten seconds after its automatic release, methyl bromide successfully extinguished a serious transformer fire. Although the fire was part of a demonstration designed to show fire-fighting apparatus in action, in other circumstances a fire of the same character would have had dangerous potentialities. Use of methyl bromide in this automatic equipment, manufactured by the National Fire Protection Co., would appear to be at least equal to carbon dioxide and similar agents for the protection of electrical apparatus.

Comparative Value

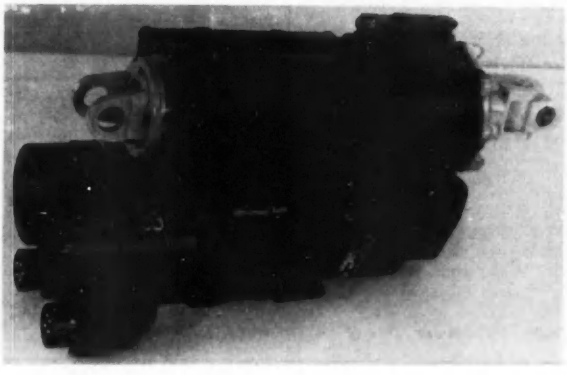
It was seen to be as effective in operation as carbon dioxide, and the company uses as a basis for calculating adequate fire protection equipment a 5% concentration of methyl bromide equivalent to the 50% concentration of carbon dioxide required. At this concentration, moreover, experience indicates that methyl bromide is far less toxic than 50% carbon dioxide. To guard against possible fatalities arising from methyl bromide inadvertently discharged, a lachrymatory agent is added to prevent personnel remaining in the contaminated area. Its value for protecting electrical apparatus is enhanced by the low value of its electrical conductance as indicated in a report from the Faraday House testing laboratories. The current flowing in a jet of methyl bromide, across which was established a potential of 22·5 kV, was found to be, by measurement, 26 micro-amps, equivalent to a resistance of 865 megohms. It is also pointed out that the liquid used in this test was a mixture of methyl bromide and pentachlor-ethane whereas pure methyl bromide, now used in all extinguishers, is claimed to have a higher electrical resistance.

For use in substations and similar locations automatic equipment is recommended. Operation in event of a fire, commences with the breaking of a combined gun-cotton and fusible link, culminating in the ejection of liquid methyl bromide, which evaporates almost immediately over the apparatus. Although the gas is stored as a liquid at pressures from 50-100 lb/sq in. (compared with pressures of 700-800 lb/sq in. at which carbon dioxide is stored), its low melting point ensures its rapid evaporation.

A Two-Speed Actuator

THE linear actuator is a device almost exclusively restricted to the use of the aircraft industry, yet there must exist many applications in the wider field of engineering where this device could be usefully employed. Among the range of existing actuators is the Type 271 unit made by the English Electric Co., Ltd. In this machine, two entirely separate motors provide the power for the high- and low-speed drives, each motor having an electromagnetic brake fitted to obtain accurate positioning at any point during the stroke. The rotary movement of the motors is translated into linear motion by differentially arranged gear trains and a non-reversible Acme nut and screw. Two speeds are provided to cater for such applications as control surface trimming in aircraft, the high speed being available for rapid changes of adjustments of trim on landing or take off, and the low speed for fine adjustment in level flight.

Weighing only 31 lb, loads of 8,000 lb can be dealt with by the unit on the high-speed drive, and up to 16,000 lb on slow speed. An ultimate load of 27,000 lb can be withstood and the mechanism is fully protected and contains the necessary equipment for remote indication of its position.



This picture shows the English Electric Type 271 two-speed linear actuator for aircraft

The WEEK in NEWS

City To Inquire Into Fuel Charges

Liverpool Wants Explanation of Electricity Prices

THE newly established Fuel Charges Special Committee, set up by Liverpool City Council to inquire into the rising costs of fuel, particularly gas and electricity, has held its first meeting. Ald. A. Critchley, chairman of the Lighting Committee and chairman of the former Electric Power Committee, was elected chairman of the new body, with Clr. A. W. Lowe as deputy chairman. Presiding at the meeting, the Lord Mayor said he thought all consumers would welcome the inquiry. Lighting throughout the city had been reduced considerably during recent months, even in the home, and all would be grateful for any action which could be taken to brighten the city, said the Lord Mayor. One of the first actions of the committee was to ask the city treasurer to prepare a report on all the increases in fuel charges which had taken place since nationalisation.

Ald. Critchley explained that it was their intention to obtain a reasonable explanation of the increases. As far as electricity was concerned, the pre-nationalisation cost of lighting street lamps was £28,700. At present it was £40,000. All that money had to be found from the rates. Instancing the effect of those rising costs, Ald. Critchley said that a pre-war scheme to convert gas street lights to electricity would have cost £36,000 for service lines only. Last summer a new service charge of £10 per position had been imposed, taking the cost up to about £150,000.

Although primarily concerned with the effect of increased charges on the Corporation, the committee will also endeavour to assist other consumers.

Board of Trade Announces Changes in Export Licensing

SOME changes in export licensing control have been announced by the Board of Trade. The alterations came into force yesterday, Wednesday. Although there are numerous changes only a few are applicable to the electrical industry and these may be conveniently divided into three classes. Licences will be required in future, for all destinations, for non-ferrous welding electrodes. In Group 6(1) of the First Schedule welding electrodes have been added to the words welding rods. In the second instance, licences will also be required for recording oscillographs, and optical (disappearing filament) and radiation type pyrometers, for all destinations other than the Commonwealth, the U.S. and Eire. (This excludes Hong Kong). Finally, licences will not be wanted for certain types of accumulators. This concession will not apply to exports to China, Hong Kong and Tibet.

MODIFICATION OF DEFENCE REGULATIONS

PROVISIONS for the appointment of a controller to take control of certain types of undertaking for the Government are removed from the Defence (General) Regulations, 1939, under a recently published statutory instrument (1952 No. 2091). The Regulation concerned, No. 55, had been extended in operation by various Acts and instruments, but last month the Home Secretary announced in the House of Commons that it would be modified.

Consequent upon this revocation of part of Regulation 55, there is a textual alteration to Regulation 56, which is specially concerned with public utility undertakings. The general powers under this regulation to relax obligations under other Acts are, however, retained.

One further alteration is made to Regulation 55: restrictions on the action of courts of summary jurisdiction and of quarter sessions are removed.

Another newly issued Statutory Instrument (No. 2101 of 1952) extends for another year the Patents (Extension of Period of Emergency) Order 1950, which Applies to special powers exercisable by the Crown under the Patents Act 1949, during periods of emergency.

The First Half-Century

Now that a.c. voltages of 10,000 or more are not uncommon, the difficulties in the way of obtaining accurate measurements of current, pressure and power by ordinary methods have appreciably increased. The usual way is to provide a special transformer for reducing the pressure on the instrument circuit ten- or twenty-fold. But it is no easy or cheap matter to build a small transformer to take 3,000 or 5,000 or 10,000 V on its primary; the chance of breakdown, especially in the high pressures, is great enough to make the transformer a weak point in the system.—*From our issue of December 18, 1902.*

English Electric Gets $700,000 U.S. Order

AN order for the manufacture of two 125 MVA transformers, with a voltage ratio 220/26 KV, has been placed with the English Electric Co. Ltd. by the city of Seattle, U.S. The contract is estimated to be worth about $700,000. The transformers will be among the largest to be built in this country. Tenders submitted about three years ago by two British electrical firms, one of which was the English Electric, for transformers for Seattle were declined although more attractive than U.S. competitors'. This is the second large American contract won by English Electric this year. The first, last May, was for a heavy-duty transformer for the Folsom power project, California.

N.W. Board Modifies Industrial Tariffs

FOLLOWING consultations with various trade organisations, the North Western Electricity Board has agreed to modify its new standard industrial tariffs which are based on a kW maximum demand. A number of textile mills who had to resort to short-time working found that the average price per unit was higher than normal. To offset this the Board has agreed to apply ceiling prices of 2d p.u. to the standard industrial tariff "M," and 2½d p.u. for quarterly tariff "Q," except where special agreements apply.

E.C.A. BRANCH TO ALLOCATE CONTRACTS

SUNDERLAND Corporation are to negotiate prices for electrical contracting work with the local branch of the Electrical Contractors Association, instead of with individual firms, in order to hasten the completion of new housing estates. Reason for this decision, which was taken as an emergency measure, is the shortage of skilled labour in the electrical trades. The matter came to a head when tenders were invited for electrical installations in 550 houses on four estates, and only two were received.

After negotiation with the E.C.A., a price of £15,224 was fixed, which was actually £1,750 more than the lower tender submitted. Firms to carry out the work will be selected by the association. Chairman of the E.C.A. branch has stated that there were no surplus electricians in the area and some contractors had taken on jobs in the hope of finding labour and had not been able to do so. As a result contracts had been delayed. The recent arrangement was an effort to prevent this, and contracts would be allocated according to the labour force available, he said.

Film of Electric Resistance Welds

A NEW film produced for Stewarts and Lloyds Ltd., entitled "E.R.W." (Electric Resistance Weld), was shown in London for the first time last week. The picture featured the modern electric resistance weld mill installed comparatively recently in the company's Corby works, Northamptonshire. The process involved is the welding of a cold rolled steel strip, which has been cold formed into a cylinder by means of a comparatively high frequency a.c. without the addition of any weld metal. After briefly touching on the steel and strip making processes the film covers the E.R.W. process in detail. By way of a supporting programme, "The Great Jib," dealing with the construction of the famous walking dragline, was also shown.

APPEAL IN DERWENT POLLUTION CASE

EARLY this month the Court of Appeal began the hearing of appeals by the defendants and plaintiffs in the Derwent River Pollution Case. Readers will recall that the action was brought by the Pride of Derby Angling Association and the Earl of Harrington against Derby Corporation, British Celanese and the B.E.A. The B.E.A. was sued for discharging into the river, water which had been heated in the process of generation, and Mr. Justice Harman granted an injunction against the Authority, but suspended it for two years. We reported his decision on April 10.

Since the opening of present proceedings, the court has been hearing evidence of Derby Corporation. Mr. H. Salt, Q.C. presented the appeal of the B.E.A. The Authority is not appealing against liability but merely asking that they should be allowed to discharge the water into the river of such a quality and temperature that it would not cause injury to the rights of the plaintiffs in fishing. It is asked that the order against them be varied.

As we go to press we learn that the appeal of the B.E.A. has been allowed.

ELECTRICAL COURSES IN LONDON NEXT YEAR

A COMPREHENSIVE list of special advanced courses in higher technology which will be held in London during the spring, has just been produced in booklet form by the London and Home Counties Regional Advisory Council for Higher Technological Education. The particular appeal of this pamphlet is that it gives those courses which do not regularly appear in college calendars or prospectuses as part of the normal curriculum. Those enumerated are usually part-time courses, but specially arranged full-time courses of less than three months' duration have also been included.

There is a complete index of courses as well as an index of the colleges concerned. We note that several are concerned with electricity, strain gauges, power systems, supply practice, acoustics, the effect of lighting, being but a few of the subjects to be dealt with. In each reference, the College, lectures, time and number of meetings, plus a brief synopsis, and the type of student who may be interested, are given.

REPLIES TO NORTH WALES COMPLAINTS

WITH the object of answering complaints about higher charges for electricity, Mr. T. R. Smith, sub-area commercial officer of the Merseyside and N. Wales Electricity Board, attended a meeting of the Penmaenmawr Council last week. He said it was his view that the Board had done well to keep the average prices of electricity at existing levels. Asked whether consumers could hope for a reduction in the Board's administrative costs when the new standard tariffs were operating smoothly, Mr. Smith said there would certainly be a reduction of that nature. He would not commit himself by saying that such a reduction would in itself be sufficient to offset increases in the price of coal and capital goods.

In reply to further questions, he stated that all N.Wales had the benefit of Merseyside sharing the cost of coal with them. Taking 15 local quarterly bills as an example, Mr. Smith said they showed an average reduction of a farthing a unit.

An apparently simple installation, which had to provide for detailed work of assembling valveholders at McMurdo Instruments, Portsmouth

Lighting for Intricate Assembly Work

A NEW lighting installation is probably more important to the onlooker from the aspect of the difficulties which had to be overcome than from the actual fittings employed. At the recently opened assembly shop of McMurdo Instrument Co. Ltd., Portsmouth, there were two considerations to be borne in mind by lighting engineers of British Thomson-Houston Co. Ltd. The shop is used for assembling all sizes, including the most minute, of valveholders, and consequently light was required of sufficient intensity for intricate work. Soft light without glare and shadows was desirable. The new building had also been decorated with modern pastel colours, and the lighting had, therefore, to be of a modern and clean design to harmonise with the scheme.

Solution was found in the employment of twin-lamp fluorescent fittings in three rows mounted at a height of 12 ft. Distribution of illumination was found to be entirely suitable without the addition of local lighting. Resulting conditions have in fact led to better work and increased production, it is reported. Contractors for this installation were D.C. Engineering Co. Ltd. All the equipment was supplied by the B.T.H. Co.

DEALERS' AIDS

New Lamp Cartons in time for Christmas

PRODUCED specially for the coming festive season is an attractive carton for Argenta lamps, which will be distributed to dealers by Philips Electrical Ltd. The box is in red and white on a blue background. It is in two sizes, the larger holding two 100 W lamps and the smaller two 60 W lamps, selling at 5s. 8d. and 4s. 7d. (incl. P.T.) respectively.

Another new lamp pack, though not specifically intended for Christmas, has been designed and produced by the G.E.C. for their Osram 25 W, 40 W, 60 W, and 100 W lamps. Each of the large cartons accommodates 20 two-way packs and 20 three-way packs, so that however many lamps have to be sold at one time, the number can be provided by a combination of these smaller packets. Should only one be required, an individual lamp can be pushed out of any pack and remain suitably protected.

TV Publicity Plans

PLANS have been laid by Mullard, Ltd., for their advertising campaign during the winter. Its main objects will be twofold. Firstly to emphasise the need to check and test receivers and valves regularly, and secondly to persuade the public to invest in the company's valves and TV tubes. Apart from the Press campaign, numerous display material will be available for distribution to dealers. This media includes a range of showcards, cutouts and a three-dimensional display unit featuring the Mullard's "Sidney" character.

OFFICIAL PUBLICATIONS

DEFENCE REGULATIONS (NO. 2) ORDER, 1952. S.I. 2091. H.M.S.O., 4d. (See page 1134.)

STATISTICAL ABSTRACT FOR COMMONWEALTH. *Trade of Commonwealth during years* 1948-51. H.M.S.O., 15*s*.

PATENTS (EXTENSION OF PERIOD OF EMERGENCY) ORDER, 1952. S.I. 2101. (See page 1134.) H.M.S.O. 2d.

PURCHASE TAX (NO. 9) ORDER, 1952. *Excluding certain Coronation decorations from effects of purchase tax.* H.M.S.O. 2d.

ALSO: TEMPORARY RELAXATION TO I.E.E. WIRING REGULATIONS (and Abridged Regulations) *Obtainable from I.E.E.* (See page 1104.)

GERMAN RADIO SHOW IN AUGUST, 1953

BECAUSE television could not be provided throughout Western Germany until early next year it was decided last summer to postpone the Great German Radio and TV Exhibition. It was tentatively fixed to open at the end of February, but an official announcement has now been made to the effect that the show will take place on the Dusseldorf exhibition grounds between August 29 and September 6.

Action to ban more Electric Signs

A SECOND inquiry has been held to examine whether or not an electric sign should be taken down. Not long ago Westminster City Council sought to expel all illuminated signs from the south side of Trafalgar Square. The latest inquiry concerned a sign in Ludgate Circus.

The advertisers contended that it was ridiculous to suggest that Ludgate Circus was one of London's beauty spots to which visitors might be directed. From the point of view of amenity, areas could be divided into three categories. All advertisements should be excluded from areas such as Regents Park. Secondly, there were districts where advertisements could properly continue, such as the Elephant and Castle. Thirdly, there were areas where it would be unreasonable to ban all signs. Ludgate Circus seemed to be closer the second category than the first.

The City of London argued that the Circus was the principal gateway to St. Paul's and was on the processional route. This it was stated was an important consideration in view of next year's festivities. 75% of visitors passed the site on their way to St. Paul's. Findings of the inquiry are expected to be announced later.

Appealing Light for Cocktail Bar

AN attractive lighting scheme has recently been installed at the Hendon Hall Hotel, the former home of David Garrick. Most appealing room in the hotel (possibly for other reasons apart from the lighting) is the bar. A curved soffit above houses three louvred lighting fittings each with two 4 ft 40 W fluorescent tubes. The reeded glass panels of the counter have been lit from behind by five 2 ft 20 W tubes. The remainder of this lounge has been illuminated by wall-brackets and louvred ceiling fittings. An adjoining room, similarly furnished, has been lit in the same way though on a reduced scale.

Apart from the cocktail bars, other rooms in which new lighting systems have been fitted are the ballroom and its annexe. These are often used for meetings and consequently F41011 two-light fittings (six in all) with 5 ft 80 W tubes were used, running along the ceiling beams. Four wall-brackets housing 3 ft 40 W tubes illuminate the decorative mirrors above them. All the equipment in this installation was supplied by the G.E.C. and the electrical contractors were S. G. Thaine Ltd.

ANNUAL DINNER

NEARLY 250 members of the staff from London and branch offices and from overseas attended the recent annual staff dinner of T. Clarke and Co. Ltd. Since the company's formation in 1889 it has gradually expanded to cover most of the world.

Floodlit Cathedral

A RECENT visitor to Spain has been impressed by a system of decorative lighting which he passes on as a suggestion for Coronation festivities. It was noted that the windows of Barcelona Cathedral were illuminated from the interior. The effect was quite unusual, apparently, and far more attractive than the normal method of floodlighting from outside. The many historic and beautiful cathedrals in Britain should lend themselves to such schemes.

The bar at Hendon Hall Hotel showing the bar with louvred soffit above and glass panelled counter. Above is another corner of lounge showing ceiling fitting and wall-bracket

This humorous display appropriate to the season is to be found in the Regent Street shopwindow of Hurseal. The little eskimo figures have been made of sections of insulation jackets for hot water tanks or cylinders. Oil filled radiators, electric blankets and room thermometers are suggested as presents

NEWS IN BRIEF

E.I.B.A. has announced that after all expenses had been paid total profit from last month's Electrical Industries Ball amounted to £1,411 5s. 10d.

Course of seven lectures on the Technique of Technical writing is to be given by Mr. G. Parr at Borough Polytechnic on Thursdays at 6.30 p.m. The course begins on January 15 and the fee is 30s.

The many activities of the blind, both at work and play, are recorded in the 37th annual report of St. Dunstan's for the year ended March 31 last.

Specialised exhibits at the International Fair of Liége next year include electronics in industry and power engines. The Fair is to take place between April 25 and May 10.

Winner of the Institute of Executive Engineers'and Officers' 1952 Gold Medal was Mr. C. F. White, for his paper on "Television—Its Transmission and Reception."

An action brought against the N. of Scotland H-E Board by the Glenmoriston Hotel, Inverness-shire, has been settled out of court. The Board was sued for damages arising out of the disturbance of Levishie forest deer through a survey carried out there. An acceptable offer has been made by the Board.

ANNIVERSARIES

75 Years

MANAGERS and heads of departments have contributed reports of activities and developments over the past 25 years to the 125-page brochure produced by Oerlikon Ltd. to celebrate their 75th anniversary. Amply illustrated and printed on art paper, the articles give an historical survey covering the company's many fields of progress—research, heavy electrical plant, small machinery, control gear and electric traction.

25 Years

CLAIMING to be the first company to develop industrial photocell applications in this country, Radiovisor Parent Ltd. recently celebrated their 25th year as designers and manufacturers of photo-electric equipment. The firm's activities include contributions in the fields of aircraft manufacture, street lighting, smoke density and welding.

Prizes for Apprentices

ANNUAL apprentice prize-giving of Hoover, Ltd., took place earlier this month at the company's Perivale works. Over 40 awards were presented in the course of the evening to employees who had been engaged in a variety of activities. Besides the distribution of prizes, the function included a conducted tour of the works, a film show, and a one-act play performed by the apprentices' association.

Questions in Parliament . . .

Uranium in N. Rhodesia

Secretary of State for the Colonies said last week that a workable uranium deposit had been discovered in N. Rhodesia and exploratory work was in progress. He could not disclose the quantities which might be available.

Gas Works Producing Electricity

Sir W. Wakefield asked about the restrictions imposed by electricity undertakings on the generation of electricity by gasworks. The Minister of Fuel and Power said he was unaware of any such restrictions.

Thermal Energy on St. Lucia

A preliminary investigation only had been carried out on the establishment of a plant to produce thermal energy from sulphur springs available on the island of St. Lucia in the West Indies, stated Mr. Oliver Lyttelton last week. Before experimental drilling could be undertaken a detailed geological study would be necessary.

Coronation TV.

Mr. D. Gammans stated he hoped to make a statement soon on the relay of B.B.C. television transmissions of the Coronation to cinema audiences.

Wavelength Allocation

There was little likelihood of a conference, similar to that held in Copenhagen in 1948, reaching agreement on a new plan giving the U.K. an extra long or medium wavelength, the Assistant Postmaster-General stated last week. He did not, therefore, intend to promote such a conference.

Interference by TV

Although aware of complaints of interference by television receivers to reception of sound broadcasting, there was no action which the Postmaster-General could take to make it an offence for manufacturers to market sets which caused that interference, it was stated in reply to Mr. W. Paling. It was understood, however, that manufacturers were voluntarily modifying their designs to reduce the risk of interference being caused.

Service from Kirk O'Shotts

Mr. D. Gammans stated in a written answer that whilst the service area of the Kirk O'Shotts high-power TV station extended as far as Montrose, it was not intended to, nor could it, provide a reliable service in N.E. Scotland. He had been asked whether steps were being taken to provide a service from Kirk O'Shotts for N.E. Scotland in time for Christmas.

Electricity Tariffs

Last week we reported (on page 1086) that Mr. Llewellyn had taken up Cardiff's protest against S. Wales Electricity Board's new tariffs. He asked in the House last week on what date permissive approval had been given to the principle that the number of rooms in a house should be the basis of assessment of electricity charges, whether or not the rooms were wired for electricity. Mr. Geoffrey Lloyd replied that approval had been given to general principles for the standardisation and simplification of methods of charge in February, 1951. Those principles included the method of assessment mentioned, the boards being left to adopt standard definitions for the determination of assessable rooms. In certain circumstances the boards had discretion to adopt floor area as the basis of assessment. Mr. Lloyd added that those bases of assessment had been in common use for many years by electricity undertakings.

B.I.F. Site

In a written answer last week, Mr. Mackeson stated that consideration had been given to the use of the South Bank site for next year's B.I.F. The site would be too small, he said, unless a building with several storeys was erected. Replying to a further question, Mr. Mackeson stated that the possibility of improving transport communications between London and West Bromwich was being discussed with appropriate authorities.

Details of Public Boards

The Prime Minister announced that a White Paper giving a list of all members appointed to the central and regional nationalised boards of a commercial character was to be published soon. He declined to give information on salaries and expenses paid to directors and managers of the larger private enterprise undertakings. Mr. Noel-Baker then asked if, at least, information could be given about salaries and expenses paid to directors and managers of private coal and electricity undertakings before nationalisation. Here again, Mr. Churchill refused to give information of that nature.

Fireguards

On Thursday, the Home Secretary, Sir David Maxwell Fyfe, announced that for the purpose of regulations to be made under the Heating Appliances (Fireguards) Act, he proposed to use as a basis a specification which the B.S.I. had prepared in consultation with the Home Office. This Standard incorporated the standards of guarding already contained in B.S., to which the larger manufacturers of gas and electric fires had been working in the last few months. He hoped that the necessary consultations upon the regulations would be completed in time to allow of their being "made" early in the New Year. In reply to a question about the date of operation of the regulations, he promised further information.

Socket Outlets

Mr. George Craddock, in a question to the Home Secretary, alleged that the market was being flooded with "cheap electricity heating and lighting points" which were a constant danger to both life and property. The Home Secretary replied that he had consulted the Minister of Works on the matter, and had been informed that there seemed to be no evidence to support this suggestion. In a supplementary question, Mr. Craddock stated that he had in mind electricity points and appliances with no proper cover, and offered to provide the Home Secretary with information on this claim. Mr. Nabarro joined in the exchange with a statement that the principal cause of the difficulty was that the Electricity Supply Regulations made in 1937 were now many years out of date, and urgently required revision. He alleged that the Minister responsible and the electricity authorities had constantly put off the matter.

Powers of Entry

In reply to a question about the number of officials authorised to carry out inspections and investigations in private and business premises without a search warrant, Mr. Boyd-Carpenter presented a table which showed, for the Ministry of Fuel and Power, 224 officials with powers of entry on enclosed land and business premises. None of these was entitled to enter private houses used as such.

Science Teachers

Questioned about the supply of men qualified to teach science and mathematics in schools, which, it was alleged was slowly decreasing, the Minister of Education denied that there was any such falling off. She said that schools still needed more teachers of this kind, but that more were employed than last year, and more were trained.

Electric Supply News . . .

Ayrshire

Formal application has now been made by the B.E.A. to the Minister of Fuel and Power for the establishment of a new generating station adjoining Barony colliery, Auchinleck, Ayrshire. This station is included in the Authority's generating plant programme up to 1957. The station, which will have two 30 MW turbo-alternators and four 150 k lb/hr boilers, will operate on slurry from Barony colliery. The project is being handled in collaboration with the National Coal Board.

Bankside

A limited amount of electricity is expected to be available from the new Bankside power station in the periods of heavy demand during the present winter. Owing to difficulties which have been experienced in obtaining cast-iron casings, the flue gas washing plant with which the station is being equipped is not likely to be ready for 3 or 4 months, the B.E.A. state. But the initial 60 MW set and the first two oil-fired boilers will begin commercial operation within the next few weeks.

Buckinghamshire

The County Planning Committee has now reported that the only practicable route for the 275 kV grid line from Castle Donington power station to a substation proposed for Round Coppice estate, Iver Heath, is one which cuts through the heart of the Chilterns. This report follows prolonged discussions on the matter. Since the plans of the B.E.A. for the grid line route were made known over a year ago, Bucks County Council has fought hard for deviations of the route to avoid it striding over famous landscape areas. As a result the Authority has agreed to scrap a proposed route through the Chilterns by Coombe Hill and the Chequers Estate, and to bring the line through the Wendover gap. The County Council has agreed to sell to the B.E.A. about 17½ acres of Round Coppice estate, Iver Heath, including Mansfield House, for the erection of a substation at the terminal point of the new line. The purchase price is £7,500.

Eire

The Electricity Supply Board announces that the contracts for the main civil works in connection with the River Lee hydro-electric development were placed this week. A French engineering firm, the Societe de Construction des Batignolles, will construct the dam, power stations and ancillary works at Carrigadrohid and Inishcarra. A Dublin firm, Messrs. John Paul and Co., will build the three major bridges and the new road diversions which become necessary as a result of the flooding of about 3,500 acres of land to form the reservoirs for the two power stations. The larger of the stations will be built in the gorge at Inishcarra about 9 miles from Cork City and will have two generating sets of 15,000 kW and 4,000 kW capacity. Here the dam will be 173 ft high by about 813 ft long. The reservoir will provide a storage of about 21 million tons of water and the water level will be raised about 100 ft. The second station at Carrigadrohid, about 10 miles up river from Inishcarra, will have an 8,000 kW generating set. The dam at this point will be about 70 ft high and 350 ft long. The reservoir above this station will hold some 25 million tons of water. Both stations will, it is estimated, have an average output of 80 million units a year. Construction work will begin shortly.

Inverness-shire

Inaugurating a supply to 53 premises at Dores, Inverness-shire, last week, Sir Hugh Mackenzie, vice-chairman of the North of Scotland Hydro-Electric Board, said that unless the Board was able to preserve its identity, there could never be schemes like the Dores one in the Highlands. Sir Hugh said that the board would be subsidising the local scheme to the extent of £2,300 a year. Such schemes could be undertaken only by the board ploughing back some of their surplus profits. The cost of the extension in the supply to Dores, on the shores of Loch Ness and only five or six miles from Inverness, was approximately £16,000, and the remaining £900 of the £3,200 economic annual cost was being paid for by the consumers. The board had been criticised about its charges in rural areas, but if they did not have reasonable guarantees from prospective consumers such development could not be undertaken. He revealed that from January of this year until the end of October 15,771 new consumers had been connected in the board's area, and they hoped that the figure would reach 20,000 by the end of the year.

LIGHTING SCHEMES

Bradford.—T.C. recommended to apply for consent to borrow £2,464 for street lighting on Buttershaw estate, section 'B'; £2,273 for similar work at Brierley estate, sections 'A' and 'B', and £1,080 for improving lighting in Town Hall Square.

Bromley (Kent).—The M.o.T. has approved a £7,143 scheme for fluorescent lighting from the borough boundary at Bromley Hill to the junction of Masons Hill and Wendover Road.

Bucks.—The County Council has approved the raising of a loan by Chipping Wycombe Parish Council for improved lighting on the London-Oxford road at Loudwater. Cost is £2,000.

Clevedon.—The Finance and General Purposes Committee has agreed to the proposal to convert street lighting from gas to electricity.

Hanley.—The Highways Committee has approved a scheme for electric lighting of Stage I of the Park Lane estate, at a cost of £1,460.

Company Activities . . .

British Thermostat Co.

The directors propose to increase the authorised capital to £650,000 by the creation of 1,400,000 new 5s. Ordinary shares. A further proposal is to convert the 48,000 5s. Founders' shares into 5s. Ordinary to rank with the existing Ordinary, holders of the converted shares being allotted 40,000 5s. Ordinary by way of capitalisation of £10,000 of the share premium amount as compensation for relinquishing voting rights. This operation is a preliminary to a scrip bonus and an issue for cash to Ordinary holders, subject to obtaining Treasury consent.

Crabtree Electrical Industries

The reduction in profits during the year (particulars of which were given in our November 6 issue) was due to more difficult trading conditions. The principal cause for this, being that we had now reached the end of those unnaturally inflated orders, stated Dr. Herbert Schofield, C.B.E., the chairman, at this meeting last week. The high figure of £730,000 for stocks in hand, was the result of obtaining raw materials for the factories, and the need to carry a large range of finished stocks in order to give customers efficient service. He reported encouraging and steady progress in expansion of the export trade, and with the easy selling days over, it would be necessary to be particularly energetic in order to compete effectively in all markets. The company was in a strong position to do this, he added.

Dewhurst & Partner

There was another satisfactory increase in trading and in profits during the year ended September 30 last. The net profit also was well up, despite an increase of £35,000 in the provision for taxation. Current assets at £414,289 is a rise of over £50,000, most of which is in respect of Tax Reserve Certificates. The directors report that building operations on the extensions of the works are now completed and the new building is in occupation.

Year to Sep. 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	73,401	29,253	89	30	8/10	7/7
1949	77,062	32,125	97	30	8/10	7/7
1950	86,806	36,738	111	35	9/10	7/9
1951	117,309	40,764	44	22½*	4/9	3/3
1952	172,860	51,601	55	19	5/1	3/11

*Capital bonus 200%.

Electric and Musical Industries

After referring to the unfavourable effect on sales of the introduction of a 33⅓% minimum deposit under hire-purchase agreements, Sir Alexander Aikman, chairman, stated at the annual meeting last week that the public's lack of purchasing power had continued. Though the worst may have been seen, the first half of the company's current year had already gone with disappointing results.

Sterling Electric Holdings

Approximately 75% of the total turnover in the electric domestic appliance section during the year went for export, states Sir Albert N. Braithwaite, chairman. (The company's subsidiaries include Electrix, Ltd.) Output has been temporarily reduced due to restrictions in many countries, he says, but the export position generally is now improving and turnover under this heading is steadily recovering. The Sterling Engineering Co., another subsidiary, has recently received interesting armament orders.

Year to Mar. 31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	88,214	3,133*	—	—		
1949	61,739	16,291	15	—	Not	Not
1950	3,851	2,259	—	—	quoted	quoted
1951	92,682	29,204	50	—		
1952	81,914	18,052	22	—		

* Loss.

Plessey Co. Ltd.

With an increased volume of production there is again a jump of about £250,000 in the consolidated profit for the year. Production in one or two directions did in fact decrease, but this was more than counterbalanced by increased volume in others. Mr. A. G. Clark, chairman and managing director makes some pungent remarks on the burden of taxation. Referring to the Excess Profits Levy, he states that during the last war the company was on armament work. When the war ended, to re-establish commercial work from scratch and the cost of so doing, both in terms of cost and restricted output, meant that with standard years the firm's profit were far from a fair measure of its normal earning capital from the usual work. For this, the penalty the company will pay is taxation on a penal scale for an indefinite period.

Year to June 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	254,293	68,438	31	20	22/4	13/6
1949	297,235	84,647	43	20	18/6	13/-
1950	284,112	70,058	33	20	19/-	14/3
1951	597,467	204,522	144	22½	22/3	17/-
1952	844,978	234,190	158	25	19/9	16/3

Ship Carbon Co. of Great Britain

Ordinary stockholders are to be offered a one-for-six scrip bonus, the directors announce.

Dividends Declared

British Insulated Callender's Cables, Ltd.—Interim Ordinary dividend of 2% (*same*) on capital increased by £3,109,614.

George Kent, Ltd.—Interim of 3% (*same*).

Pinchin Johnson.—Ordinary interim of 7½% (*same*).

Commercial Information

CONTRACTS OPEN

HOME

Dec. 19.—Neath T.C. Provision and erection of electric flashing units and globes for 17 pedestrian crossings, including cable connections. Borough Engineer's Office, Gwyn Hall. Deposit £2 2s. (See Dec. 4 issue.)

Dec. 20.—Blackpool T.C. Supply of a thousand 200/250 V synchronous motor type switches, 10/20 A with solar dial. Illuminations and Public Street Lighting Officer, Electrical Services Dept., Rigby Rd. East. (See Dec. 4 issue.)

Dec. 20. — Darlaston U.D.C. Electrical installation in between 150 and 200 houses on various estates. Applications by above date to G. R. Rowlands, Clerk of Council, Town Hall.

Dec. 22. — Manchester. Electrical installation in shops, maisonnettes, etc., at Brooklands S.E. sub-centre, Wythenshawe. City Architect, Town Hall. Deposit £1 1s. (See Dec. 4 issue.)

Dec. 22.—West Riding. Renewal of electrical installation in Pudsey Primrose Hill S.M. school. County Architect, Bishopgarth, Westfield Rd., Wakefield.

Dec. 23.—Burton-on-Trent T.C. Street lighting works, comprising 34 fluorescent lanterns on concrete columns, along four streets. Borough Surveyor, Town Hall. (See Dec. 4 issue.)

Dec. 26.—Rutherglen T.C. Supply of 17 flasher units for illumination of pedestrian crossing beacons. Burgh Surveyor, Town Hall Buildings.

Dec. 27.—Dundee. Electrical installation in erection of west wing of Duncan of Jordanstone College of Art in Perth Rd. Donald Smith, Seymour and Rooley, Consulting Engineers, 204 West Regent St., Glasgow.

Dec. 27.—Farnworth (Lancs.) T.C. Supply of equipment for illumination of pedestrian crossing beacons. Borough Engineer, Town Hall.

Dec. 27. — Silsden (Yorks.) U.D.C. Wiring of 30 houses on Elliot St. Estate. Sanitary Inspector, Council Offices.

Dec. 27.—St. Neots U.D.C. Installation of electricity of 36 houses in Potton Rd. Surveyor to Council, Council Offices, Huntingdon Street.

Dec. 29.—Exmouth U.D.C. Supply of ten complete pedestrian crossing lighting assemblies. R. J. Humphreys, Engineer and Surveyor, Templetown Lodge, The Esplanade. Deposit £1 1s.

Dec. 31. — Beckenham (Kent) T.C. Contractors are invited to tender for jobbing work in electrical trades during year beginning April 1, 1953. Borough Engineer, Town Hall.

Dec. 31.—Littlehampton U.D.C. Electrical installation for power and lighting in 32 dwellings on Wickbourne Estate. Engineer and Surveyor, Council Offices. Deposit £1 1s.

Dec. 31.—Sevenoaks U.D.C. Supply of about 500 yd. of lighting strip, floodlights and lamps for Coronation festivities. Engineer and Surveyor, Council Offices, Argyle Rd. (See Dec. 11 issue.)

Dec. 31.—Wembley T.C. List of materials required for year beginning April 1 includes supply of electric lamps. Maintenance and Transport Engineer, Town Hall.

Dec. 31.—Chadderton U.D.C. Supply of thirty 25ft reinforced concrete street lighting columns. Engineer and Surveyor, Town Hall. (Advertised in this issue).

Jan. 1.—Limerick. Conversion of creamery premises to electrical power and lighting at Belville Deel Bridge Co-op. Dairy Society, Kilmeedy. Documents from C. O'Shea, 27 College Rd., Cork.

Jan. 2.—Belfast. Supply and erection of feed water equipment at Victoria power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. Also supply of sundry materials for stores, including switchgear, cookers, street lighting units, cables, etc. Electricity Dept., East Bridge St., Belfast. Deposit 10s. (See Dec. 4 issue.)

Jan. 3.—Leeds. Tenders invited for six auto-transformer starters, 2,000 V, as floor mounting control units capable of starting pump motors from 29 h.p. to 105 h.p. three times an hour under no load conditions. Sewerage Engineer, Civic Hall.

Jan. 5.—Bletchley U.D.C. Nine sets of electrically driven vertical unchokeable sewage pumps and ancillary equipment for three pumping stations. Engineers are John Taylor and Sons, Artillery House, Victoria St., London S.W.1. Deposit £5.

Jan. 5.—Northern Ireland. Electrical work in 386 dwellings on Rathcoole No. 4 site, Whitehouse. N. Ireland Housing Trust, 12 Hope St., Belfast. Deposit 10s.

Jan. 7.—Macclesfield T.C. Supply and erection of 113 sodium lighting units on concrete columns in Class A for Chester, Chelford and Buxton Rds. J. H. Dossett, Borough Engineer, Town Hall. Deposit £2 2s. (See Dec. 11 issue.)

Jan. 7.—Sedgley U.D.C. Supply and erection of 19 precast columns, of which 18 shall have 60 W tungsten lighting equipment and one 80 W mercury equipment, with all necessary gear, for Class B street lighting on Modenhill estate. W. M. Jones, Engineer and Surveyor, The Limes, Dudley Rd.

Jan. 10.—Dagenham T.C. List of supplies for year beginning April 1 next includes electrical lamps and supplies. Borough Engineer and Surveyor, Civic Centre.

Jan. 10.—Finsbury B.C. Electric lamps included in list of supplies required in year beginning April 1 next. Borough Engineer, Finsbury Town Hall Annexe, Rosebery Ave., E.C.1.

Jan. 10.—Romford T.C. Supplies of electric lamps required during year ending March 31, 1954. Borough Engineer and Surveyor, Town Hall.

Jan. 12.—Dartford T.C. Supply and erection of 97 street lighting units, comprising 80 W mercury lamps, enclosed lanterns and cast-iron columns, for Temple Hill Neighbourhood unit. T. Armstrong, Town Clerk, Dartford. Deposit £2 2s.

Jan. 16.—Londonderry. Electrical installation at Eglinton New School. Documents from Education Office, New Row, Coleraine. Deposit £1.

Jan. 14.—Macclesfield R.D.C. Supply and installation of 34 sodium lighting units and concrete columns in Class B, for Weston Estate, Gawsworth. K. Shatwell, Clerk of Gawsworth Parish Council, Council Offices, King Edward St., Macclesfield. Deposit £2 2s. Also same for 16 sodium units on concrete columns in Class B for same estate. J. H. Dossett, Borough Engineer, Town Hall, Macclesfield. Deposit £2 2s. (Both tenders advertised in Dec. 11 issue.)

Jan. 16.—Belfast. Supply and erection of integrating and summation metering equipment for Victoria power station. Merz and McLellan, consulting Engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See Dec. 4 issue.)

Jan. 16.—Swinton and Pendlebury T.C. Provision and erection of concrete columns, bracket arms and wiring for street lighting in Station Rd. Also supply of lanterns, lamps and auxiliary equipment for same. (Separate contracts.) Borough Engineer and Surveyor, Town Hall, Swinton. Deposit £2.

No date stated.—Caithness. Electrical work in erection of secondary school at Halkirk. W. Wilson, County Architect, Wick. Deposit £2 2s.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

Jan. 5.—Pakistan. Supply of six 50 kW, seventeen 100 kW and ten 200 kW diesel generating sets with all auxiliary and ancillary equipment. Particulars available from High Commissioner for Pakistan in U.K., 39-40 Lowndes Sq., London S.W.1 (30s. a set).

Jan. 6.—India. Director General, Supplies and Disposals, requires supply of conveyors, drag-scrape loaders, bucket elevator and storage bunker. Electricity supply is 550 V, 3-phase, 50 c/s. B.o.T. (Ref. CRE 41005/52).*

Jan. 6.—India. Supply of 500,000 D.S. large porcelain insulators. Director General, Supplies and Disposals, Shahjahan Rd., New Delhi. B.o.T. (Ref. CRE 41069/52).*

Jan. 8.—Australia. Supply of 13,500 kVA power transformers for Mosman substation required by Sydney C.C., Queen Victoria Building, George St., Sydney. Specifications available from Preece, Cardew and Rider, 8-10 Queen Anne's Gate, Westminster.

Jan. 15.—South Africa. Supply of 2,550 yd of single core cable to various specifications. Union Tender and Supplies Board, 271 Visagie St., P.O. Box 371, Pretoria. B.o.T. (Ref: CRE 41604/52)*.

Jan. 15.—India. Supply of three 25 MVA power transformers for Maithon hydro-electric power station of Damodar Valley Corporation, Calcutta. B.o.T. (Ref. CRE 40222/52).*

Jan. 20.—New Zealand. Supply of 1,500 electrolytic condensers, metal cased, dry type, 1,000 microfarads capacity for 50 V d.c. Director-General (Stores Div.), G.P.O. Wellington. B.o.T. (Ref.: CRE 39487/52).*

Jan. 23.—New Zealand. Supply of 12 engine-generator sets, battery charging, with tools and accessories. Director-General (Stores Div.), G.P.O. Wellington. B.o.T. (Ref.: CRE 39486/52).*

Feb. 25.—New Zealand. State Electricity Commission of Queensland, Scottish Union Hse., Eagle St., Brisbane, invites tenders for circulating water pumps for Townsville Capricornia and Wide Bay-Burnett Electricity Boards. B.o.T. (Ref: CRE 41062/52)*.

Mar. 31.—New Zealand. Tenders invited for 21,000 kW water turbine driven alternators and 30,000 b.h.p. water turbines for Atiamuri power station. Tenders Board, Ministry of Works, Wellington and duplicate to Merz and McLellan, 32 Victoria St., Westminster. Deposit £100.

CONTRACTS PLACED

Dagenham T.C. Electrical installations in 36 flats in Eastern Ave., Eastern Electricity Board, £1,204.

Hull. Electrical work in 86 flats on Bilton Grange Estate, A. Shaw and Sons, £2,868.

London. Electrical installations in following schools: Virginia and Wilberforce, Norwest Services Ltd., £2,316 and £2,081; John Burns, Alexander Hawkins and Sons Ltd., £2,610; Heber, Honor Bros. Ltd., £4,753; Canterbury Rd., W. J. Grant and Co., £1,809; Mon[illegible]n, F. Lawrence, £3,893; Christopher Halton, Holmes and Larkinson, £1,947; Canonbury, Buchanan and Curwen Ltd., £3,590; Ashmole, E. Satterthwaite Ltd., £1,598; George Lansbury, L.S.P. Electrical Co., £3,655; Thomas Fairchild, London Electricity Board, £3,319; Flint St., Artisans (Electrical) Ltd., £2,304; Smallwood, H. A. Lamb and Sons Ltd., £4,088; Springwell House, The Beasley Electrical Contracting Co., £1,711; Earl Rise, Thorpe and Thorpe Ltd., £2,420.

Newcastle-on-Tyne. Supply of lanterns and control gear for street lighting in Barrack Rd. and Gallowgate, Metropolitan-Vickers Electrical Co., Ltd., £1,140.

Northampton T.C. Conversion from gas to electricity in certain streets, E. Midlands Electricity Board, £7,339.

Your Queries — Answered

Plastic covers for 'Hoover' washing machines, makers of? EM—Clearex Products, Ltd., Heather Park Drive, Wembley. (24579)

'Teledeltos' paper, suppliers of? A.H.—Creed & Co., Ltd., Telegraph House, Cherry Orchard Rd., Croydon. (24584)

'Bestos' Heater, makers of? M.E.—Phethean, Ltd., 409/411 Croydon Rd., Caterham. (24597)

'Queensbury' fluorescent fittings, makers of? D.E.—Queensbury Engineering Co. Ltd., Cumberland Rd., Stanmore, Middx. (24606)

'Claco' appliances, makers of? Y.B.—Charles Lathe and Co., Ltd., Upper Church Lane, Tipton. (24591)

Noma Electric, Ltd., address of? T.E.—Sarsfield Rd., Perivale, Greenford, Middx. (24615)

Aero-Research, Ltd., address of? C.B.—Duxford, Cambridge. (24624)

FURTHER ANSWER

'P. and B' Instruments, makers of? A.W.—'P. and B' Eng. Co., Ltd., Crompton Way, Crawley, Sussex. (24378)

The above are selected from questions we have answered this week. If you have a query, send it to us.

Northampton T.C. Installation of street lighting in the borough, E. Midlands Electricity Board, £7,338.

Plymouth. Electrical installation in houses on Crownhill estate, Madge and Son, £1,672. Also installation of street lighting in Alexandra and Wolseley Rds., General Electric Co., Ltd., £4,751.

Poplar B.C. Electrical installation at Block E, Tetley St., Hancox and Co., Ltd., £2,738.

Ramsgate T.C. Internal wiring of 155 houses and flats on West Dumpton estate, Barnett's Radio and Electrical Services, £1,989.

St. Pancras B.C. Supply, erection and wiring of street lighting lanterns etc. in four streets, Engineering and Lighting Equipment Co., Ltd., £6,828.

Seaham U.D.C. Electrical work in 42 houses on Westlae estate, J. Calvert.

Sheffield. Electrical installation at Holt House school, Yorkshire Electricity Board, £2,357.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Boxmag in design 710,705. Class 7. Clutches and brakes, lifting apparatus, separating machines, etc. 702,391. Class 9. Magnets, apparatus for testing magnets and floor sweeper operated by magnetic force. Electro-Magnets Ltd., Boxmag Works, Bond St., Hockley, Birmingham 19.

Corrusteel. 711,267. Class 9. Electric cables and insulated electric wire, all being steel sheathed. Wandleside Cable Works Ltd., 106 Garrett Lane, S.W.18.

Munky the Monkey. 706,305. Class 9. Wireless and television apparatus, etc. M. M. Sutcliff, 155 Stockport Rd., Ardwick, Manchester 13.

Nicralloy. B708,533. Class 9. Wire, metal strip and metal tape, all being electrical insulated material; and resistance wire, etc. Hall and Pickles Ltd., 64 Port St., Manchester 1.

Parcom. B710,984. Class 9. Telephonic inter-communication apparatus. P.A.R. Ltd., 95 Talbot St., Nottingham.

P. Pentagon P. in design 708,543. Class 9. Thermostats. Charles E. Black, 6 Church Rise, Forest Hill, S.E.23.

Prismalux. 704,152. Class 11. Electric light fittings. Wardle Engineering Co., Ltd., Elsinore Rd., Old Trafford, Manchester 16.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Monday night)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	97 10 0	112 0 0
" " "English" quality ...	99 0 0	
Tin (99·99·76%) ... ...(Cash)	942-943	—
" (3 months)	922-942½	—
ALUMINIUM, commercial purity (del.)	166 0 0	—
ZINC	110 0 0	100 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	53 0 0	—
Mild Steel Tape (0·04 in.)	39 15 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Munday (Walthamstow) Ltd., refrigeration engineers. L. S. Findlay, 4 Charterhouse Sq., London E.C.1, has been appointed liquidator with committee of inspection.

Voluntary Liquidation

Atozed (London) Ltd., electrical engineers and contractors. At meeting of creditors it was reported that statement of affairs showed liabilities of £23,159, of which £8,469 was due to unsecured creditors, £9,626 on loan account and £5,063 to bank. Assets were estimated to realise £9,953 and after allowing £932 for preferential claims, there were net assets of £9,021 or deficiency of £14,138. Resolutions passed for appointment of Mr. D. D. Mathieson, C.A., of Mathieson, King and Co., Cannon St., London E.C. and Mr. A. W. S. Tabbernor, C.A., of Jackson, Pixley and Co., Kent House, Telegraph St., London E.C., as joint liquidators, with a committee of inspection.

Clifton Electrical Services Ltd., electrical contractors. At statutory meeting of creditors statement of affairs showed liabilities of £10,908. Assets estimated to realise £62 and after allowing £59 for preferential claims, there were net assets of £3, or deficiency of £10,905. It was understood that loan creditor for £860 would not prove in the liquidation. General opinion was that affairs should be dealt with under compulsory liquidation, but after discussion it was resolved to confirm voluntary liquidation with Mr. Chambers, of Cowlishaw, Chambers and Co., Charles St., Rugby, as liquidator, with a committee of inspection.

BANKRUPTCY ACTS

Receiving Orders

London. Matthew T. Woodward, electrician trading as M. T. Woodward at 21 Chaytor Terrace, Fishburn. Date of receiving order, Dec. 5.

Brighton. Alice E. and Stanley J. Dalmon, trading as P. Dalmon and Sons, electrical engineers, at 60 Teville Rd., Worthing. Receiving order dated Dec. 2.

Wigan. Margaret J. Ruddick, trading as J. Ruddick, electrical appliance dealer, at 89 Park Rd., Wigan. Date of receiving order, Dec. 3.

George H. Battye, electrician, of Clifton Rd., Pudsey. Date of receiving order, Dec. 6.

Public Examinations

London. George H. Watts, trading with another as Watts and Watts, electrical engineers, at 185 Stockwell Rd., S.W.9, and 32 Moat Place, S.W.9. Public examination will take place at Bankruptcy Bldgs., Carey St., W.C.2, on Jan. 20, at 11 a.m. First meeting was yesterday (Wednesday).

Newcastle-on-Tyne. May Tilley, trading at 13 Shakespeare St., Newcastle, as Hawkins, Tilley and Co., electrical and radio wholesaler. Public examination will be at the Court House, 56 Westgate Rd., Newcastle, on Jan. 13 at 10.30 a.m. First meeting took place on Tuesday.

Canterbury. John G. Elridge, electrical contractor, trading at 31 Wincheap, Canterbury. First meeting at official Receiver's office, 1 The Parade, Canterbury, today (Thursday) at 11 a.m., and public examination at the Sessions House, Longport, Canterbury, on Jan. 27 at 10.30 a.m. Receiving order dated Dec. 4.

Release of Trustee

Birkenhead. Wadham E. Holloway, trading as Dominion Electric Heating Co., at 23 Market St., Birkenhead. Trustee was R. C. Johnston, C.A., 59 Hamilton Sq., Birkenhead.

BUSINESS PROSPECTS

HOME

Alnwick (Northumb.) R.D.C. Further 100 houses are planned at Shilbottle. Architects are Reavell and Cahill, Lloyds Bank Chambers.

Aylesbury T.C. Erection of 120 flats in 30 blocks on Buckingham Rd. Estate. Borough Engineer, Town Hall.

Belfast. An intermediate school is to be built at Ballygomartin (£300,000). Also a primary school at Ben Madigan (£150,000); and extensions to Currie junior primary school (£27,000). Also erection of 32 dwellings at Castlereagh for N. Ireland Housing Trust, 12 Hope Street.

Bideford (Devon) T.C. Tenders likely to be invited soon for first instalment of next year's housing schemes.

Billingham-on-Tees U.D.C. Consideration being given to construction of 42 flats behind shopping centre in Roseberry Rd.

Bingham (Notts.) R.D.C. proposes to erect 34 houses.

Bridport R.D.C. Erection of 72 dwellings on Bradpole site. L. F. A. Maddocks, Chart. Architect and Engineer, Surveyor's Office, Victoria Grove.

Buckinghamshire. Among schools to be built next year are Amersham secondary at £134,600; High Wycombe girls' at £215,400; and Langley secondary at £183,200.

Burnley. New school proposed at Rosegrove. Estimated cost £53,550.

Bury St. Edmunds T.C. Construction of 40 houses on Mildenhall Estate. N. C. Goldsmith, Borough Engineer and Surveyor, Borough Offices.

Camberwell. Scheme approved for development of Champion Hill site extension by erection of 48 flats.

Colne Valley (Yorks.) U.D.C. Approval given to erection of 50 houses on Marsden site.

Colwyn Bay T.C. Layout plans submitted for approval for erection of 232 dwellings in Elwy Rd.

Co. Down. Erection of primary school at Holywood. Roe Stevenson and Sons, Surveyors, 33 College Gardens, Belfast.

Dagenham. Junior and secondary schools to be built on Marks Gate Estate.

Darlington T.C. Contracts to be let for erection of 186 houses. Borough Architect, Central Buildings.

Dudley T.C. Tenders may shortly be invited for erection of 200 houses in Tansley Hill and Oakham areas.

Durham. The existing gas lighting at Greatham C. of E. School is likely to be replaced shortly by electricity.

Ealing T.C. Plans in hand for erection of 130 houses on Lime Trees Estate and 150 flats on S. Ealing Rd. Estate.

Eston (Yorks) U.D.C. During the next four years it is planned to build a total of 806 houses.

Finchley. Approval given to provision of secondary school in Summers Lane.

Gateshead T.C. Plans in hand for erection of 288 houses at Blackhill Hill, Heworth.

Hackney. Scheme prepared for development of Daley St. site by erection of 147 flats, 11 houses and other works.

Halesowen T.C. Erection of 48 houses on Howley Grange Estate, Lapal. Council's Architect, J. C. T. Cole, Central Bldgs., Long Lane, Blackheath.

Halifax T.C. Application to be made for sanction to borrow £229,606 for erection of 168 houses at Mixenden.

Hanwell (Middx.). Ambulance station costing £16,685 to be built in Boston Rd.

Hayes and Harlington (Middx.) It is proposed to build Yeading primary school.

Hebburn-on-Tyne U.D.C. It is proposed to build 260 houses on Monkton Lane estate. R. C. Bestow, Surveyor, Cncl. Offices.

Hove T.C. Construction of 110 flats and 20 houses on Hangleton Park Estate. Borough Surveyor, T. R. Humble, Town Hall.

Hungerford (Berks.) R.D.C. Plans approved for erection of 95 houses, shops and flats on Priory Estate.

Manchester. Erection of Moss Nook and Oldwood secondary schools. City Architect, Town Hall.

Merthyr Tydfil T.C. Site work to start soon for extension of Swansea Rd. Estate.

Old Fletton (Hunts.) U.D.C. Plans approved for building of 98 houses on Southfields Estate.

Oldham T.C. Erection of 103 houses on Holts Estate. Cameron and Middleton, Chart. Quantity Surveyors, 21 Queen St. Also plans approved for factory extensions in Atkinson St., for Meredith and Drew, Ltd.

Oxford. Next year's school building programme will include Wood Farm primary (£49,280); New Marston secondary (£88,500); and first instalment of College of Technology, Art and Commerce (£240,000).

Paddington B.C. Erection of multi-storey flats in Fulham Place. W. H. Bentley, Town Clerk, Town Hall, W.2.

Penryn T.C. Tenders may be sought shortly for construction of 33 houses during 1953.

Pocklington (Yorks.) R.D.C. Erection of total of 172 houses in three parishes. Kellett, Banks and Robson, Housing Architects, 8 Lendal, York.

Scunthorpe T.C. Plans approved for layout of Ridings Estate and for 82 houses on New Brumby Estate.

Shropshire. Next year's building programme will include first instalment of school at Market Drayton (£154,000); and junior school at Meol Brace (£59,000).

Shropshire. Construction of secondary school at Wrockwardine Wood. C. H. Simmons, county architect, Column House, London Rd., Shrewsbury.

Smethwick T.C. Construction of 202 houses in Brandhall Rd. Borough Engineer and Surveyor, Council House.

Stoke-on-Trent. Expenditure of £49,804 has been approved for erection of Blurton Newstead primary infants' school.

Strood (Kent) R.D.C. It is proposed to build 32 houses on Cliffe Estate.

Sunderland T.C. Plans in hand for erection of 300 flats at Hendon. Borough Architect is H. C. Bishop, Grange House, Stockton Rd.

Teifiside (Card.) R.D.C. Approval received for plans for 28 houses at Parcllyn and 10 at Verwig.

Tynemouth. Box-making factory at Preston, North Shields, is to be built for Foots, Ltd., of North Shields.

OVERSEAS

Cuba. Cia General de Construcciones Publicas S.A., P.O. Box 110, Santiago de Cuba, wish to receive quotations from U.K. manufacturers for supply of hydro-electric power equipment as part of private water power installation at eastern end of Cuba.

TRADE NOTES

N. Borneo. Under the amended North Borneo customs tariff, machinery for the generation, storage, transmission of electricity (except lampshades, batteries, portable lamps, electric fittings and accessories) are duty free by the British Preferential Tariff. Refrigerators also are duty free, but electrical fittings, accessories and appliances, insulated wires, and radio apparatus carry a British Preferential duty of 7½d. *ad valorem*.

New Phone No. After January 1, the telephone no. of A. H. Hunt (Capacitors) Ltd. will be Battersea 1083-7.

New Year Holiday. The works of Bruce Peebles and Co. will close on Wednesday evening, December 31, and reopen on Tuesday, January 6.

MEETINGS TO NOTE

THURSDAY, DEC. 18

A.S.E.E. (Luton Branch).—"Diesel Electric Generation." George Hotel, 8 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (E. Midlands Branch).—"Plant Control through Instruments." J. E. O. Breen. Nottingham Gas Showrooms, Parliament St., 6.30 p.m.

INCORP. PLANT ENGRS. (Blackburn Branch).—"Lubrication." Chamber of Commerce, Richmond Terrace, 7.30 p.m.

I.E.S. (Glos. and Cheltenham Centre).—"Equipment and Functions of Illumination Laboratory." H. F. Stephenson. Cadena Cafe, High St., Cheltenham, 6.15 p.m.

I.E.E. (Southern Centre).—Annual dinner and dance at Polygon Hotel, Southampton, 7 p.m.

I.E.E. (Irish Branch).—"275 kV Developments on British Grid System." D. P. Sayers, J. S. Forrest and F. J. Lane. Trinity College, Dublin, 6 p.m.

E.P.E.A. (S. Western Tech. Group).—"Any Questions," with panel from S.W. Division and Board of B.E.A. Mauretania Bar, Park St., Bristol, 7.15 p.m.

FRIDAY, DEC. 19

I.E.S. (Birmingham Centre).—"Fashion and Creative Photography in Advertising." J. Short, Regent House, St. Philip's Place, Colmore Row, 6. pm.

TUESDAY, DEC. 23

A.S.E.E. (York Branch).—"Copper." Creamery Restaurant, Pavement, 7.30 p.m.

EXHIBITION DIARY

Packaging Exbn. Third show will open at Olympia on Jan. 20. It closes on Jan. 30.

Amusement Trades Exbn. Ninth annual exbn. will take place at Old Royal Horticultural Hall, Westminster, between Jan. 27 and 29.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Barnes and Brooker Ltd., 4 High St., Strood, Rochester, Kent. To take over business of motor, electrical and general engineers carried on as "Barnes and Brooker" at Strood. Cap.: £15,000. Dirs.: A. O. Barnes and G. H. Brooker.

Enfield Electric Ltd., 45 Osborne Rd., Enfield, Middx. Electrical engineers and contractors, etc. Cap.: £1,000. Dirs.: F. W. G. Lansdowne and Mrs. E. L. Hockham.

Gradient Electronics Ltd., 152 Commercial St., E.1. Research physicists, research chemists, etc. Cap.: £500. Dirs.: B. J. Shelley and A. Thompson.

D. Howorth and Son, Ltd., 213 Halifax Rd., Rochdale. Engineers (electrical) and general electrical installation contractors, etc. Cap.: £5,000. Dirs.: D. Howorth, J. R. Howorth and Florence Howorth.

Janitorial Services Ltd., 28 Parkfield St., N.1. Vacuum cleaners, steam cleaners, etc. Cap.: £1,000. Dirs.: Miss T. Griffiths and H. E. Tomkins.

R. Langford (Cadnam) Ltd., Southampton Rd., Cadnam, Hants. Precision, mechanical, motor, aeronautical, electrical, constructional and general engineers, etc. Cap.: £1,000. Dirs.: R. Langford and Mrs. E. F. A. Langford.

Mike Lee Ltd., 54 Regent St., Rugby. Electrical engineers, electrical wiring and installation contractors, etc. Cap.: £5,000. Dirs.: S. J. Lee and S. H. Robbins.

Micox Electric Tools Ltd. Manufacturers of and dealers in electrical machines, motors, machinery, plant, apparatus, tools, etc., and to acquire certain assets and liabilities of Micox Electrical Equipment Ltd. Cap.: £500. Dirs.: R. G. Lacey, Irene M. Lacey and S. J. Carter. Subs.: F. W. Sitch, 29 Grasmere Gardens, Ilford, Essex and Patricia D. Harling, 43 Bawdsey Av., Newbury Park, Essex.

Neal Bros. (Otley) Ltd., Elec. engrs. and contractors, etc. Cap.: £6,000. Dirs.: L. Neal, 95 Albion St., Otley, and N. Neal, Wharfdene, North Ave., Otley.

E. A. Newton and Son (Engineers) Ltd. Motor, elec. and mech. engrs., etc. Cap.: £3,000. Dirs. to be apptd. by subs. Subs.: H. Teper, 7 Kenneth Cres., Willesden Green, N.W.2., B. Pritchard, 8 Nevern Pl., Earls Court, S.W.5.

A. S. Nicholls, Ltd., Buckingham House, 19-21 Palace St., S.W.1. Manufacturers of and dealers in refrigerators, refrigeration and cold storage plant, etc. Cap.: £1,000. Dirs.: A. S. Nicholls and F. A. Lipscomb.

Northern Batteries, Ltd., 47 Moseley St., Manchester 2. Cap.: £2,500. Dirs.: J. Thompson, R. Sandiford and Mrs. S. M. Dougall.

Pick and Banham, Ltd., 16 Friars St., King's Lynn, Norfolk. Electric lighting, heating, refrigerating, wireless, mechanical and general engineers, etc. Cap.: £100. Dirs.: F. Pick and G. W. Banham.

H. C. Porter, Ltd., 78/80 Queens Rd., Nuneaton. Ironmongers, hardware merchants, electrical and civil engineers, etc. Cap.: £1,000. Dirs.: H. C. Porter and Gwendoline I. Porter.

Pulsometer (Refrigeration) Co., Ltd. To take over business of refrigerator engineers and manufacturers carried on at Oxford Rd., Reading, by the Pulsometer Engineering Co., Ltd. Cap.: £20,000. Dirs.: not named. Subs.: J. E. Woodrow, The Gables, Clevedon Rd., Tilehurst, Reading, and H. M. Rabone, 8 Oak Tree Rd., Tilehurst, Reading.

W. R. Roberts (Electrical Contractors) Ltd., 56 Whitechapel, Liverpool, 1. Cap.: £1,000. Dirs.: W. R. Roberts and Mrs. E. Roberts.

Saben Hart and Partners (Manchester), Ltd. Mechanical, electrical, constructional and general engineers, etc. Cap.: £100. Dirs.: To be appointed by subs. Subs.: R. Hart, Ormdale, 31 Templars Cres., Finchley, N.3, and A. Thompson, 21 Panton St., S.W.1.

Saben Hart and Partners (Rugby), Ltd. Mechanical, electrical, constructional and general engineers, motor and aeronautical engineers, etc. Cap.: £100. Dirs.: To be appointed by subs. Subs.: R. Hart and A. Thompson, addresses as above.

Schoolbred Rewinds Ltd., 1 Langley St., Luton, Beds, Electrical engineers, electricians, etc. Cap.: £1,000. Dirs.: A. F. Plummer, M. R. Plummer. R. A. Joseph and G. W. Ryall.

SIMPLICITY, ROBUSTNESS and EASY JOINTING—these are outstanding features of HENLEY Modern (Group 24) Distribution Pillars. Every detail in their design is based on our unrivalled experience in the production of electrical distribution equipment.
Please ask for Catalogue 24
Assembling a Distribution Pillar in the Henley Factory.
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DISTRIBUTION PILLARS
Group 24
W.T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

A Y/L OUTDOOR Lighting and Sundries Distribution Board, incorporating Metering Chambers and Bus Section Switch

All live parts fully screened

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Write for Catalogues "Y.1." and "Y.2."

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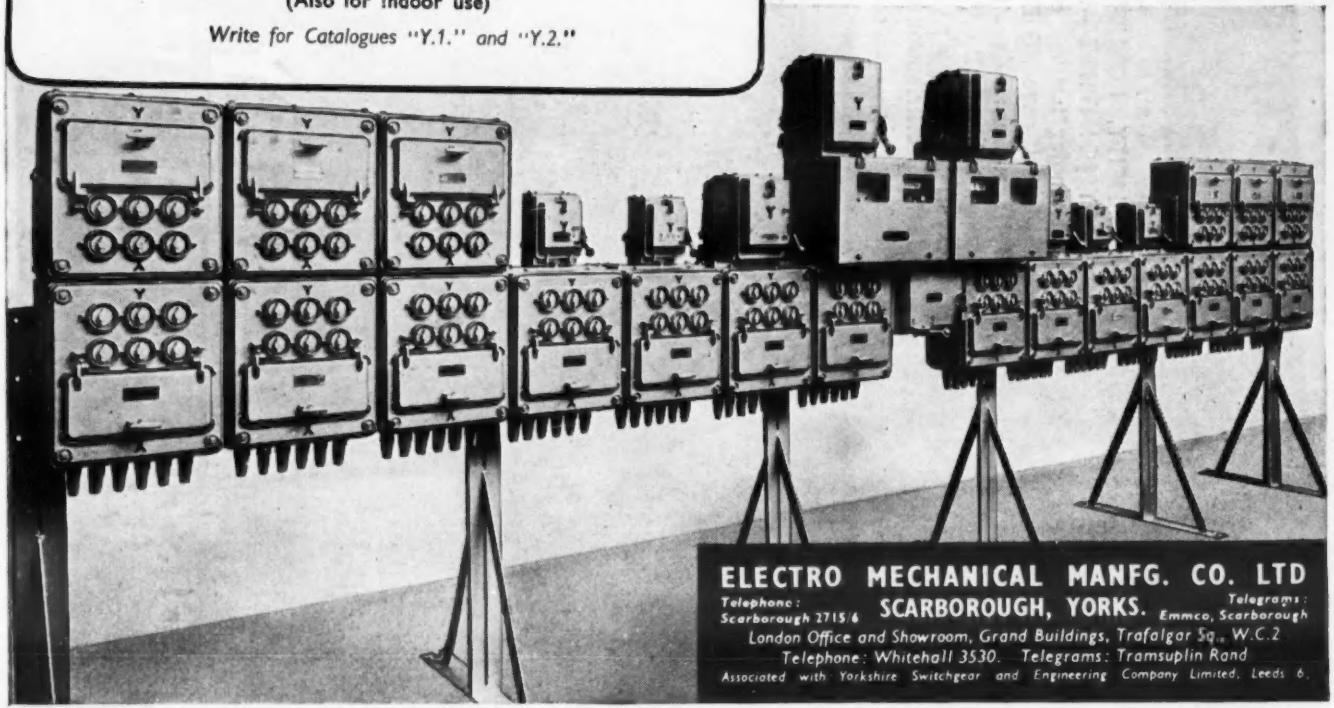

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CHADDERTON URBAN DISTRICT COUNCIL

STREET LIGHTING

TENDERS are invited for the supply of the following materials:—

Contract No. 7.—Supply and delivery of thirty 25 ft mounting height reinforced concrete street lighting columns.

Specification and forms of tender may be obtained upon application to the Engineer and Surveyor, Town Hall, Chadderton.

Tenders enclosed in a plain sealed envelope endorsed "Street Lighting—Contract No. 7" are to be delivered to the undersigned not later than December 31, 1952.

L. STOTT,
Clerk of the Council.

Town Hall,
Chadderton,
December, 1952. (C 153)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

THE BRITISH ELECTRICITY AUTHORITY invites tenders for the removal of SCRAP PLANT at the Northampton Power Station. The plant includes the removal of three turbo-alternators, and condensers with auxiliaries, and four stoker-fired water tube boilers.

The Specification of the Plant and Conditions of Sale No. 6/Northampton/56/M20 may be obtained from the Divisional Controller, British Electricity Authority, East Midlands Division, Barkar Gate, Nottingham, quoting ref. GC/FF/GGT. Application should be accompanied with a deposit of £2, which will be returned upon receipt of a bona-fide tender.

Tenders are to be delivered to the Chief Generation Engineer (Construction) not later than 12 noon on Friday, January 30, 1953. (C 184)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

South West Scotland Division

ASSISTANT SHIFT CHARGE ENGINEER
Yoker Power Station.

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Yoker Generating Station for which the salary will be within the range £607/£629 per annum, this being in Class "F," Grade 9 of the National Joint Board Schedule.

Applications on Form A.E.6 which may be obtained from the Authority's Headquarters or from any Divisional Office of the Authority should be forwarded to the Divisional Secretary, 168 Broomhill Drive, Glasgow, W.1, before December 30, 1952.

A. CHRISTIANSON,
Divisional Secretary.

December 9, 1952. (C 173)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL FOREMAN required by the Government of Somaliland Protectorate for the Public Works Department for two tours of 12 to 15 months in the first instance. Commencing salary according to age qualifications and experience in scale £688 rising to £793 (including cost-of-living allowance). No income tax at present. Free passages. Outfit allowance £30. Liberal leave on full salary. Candidates, under 35 years, must have served an apprenticeship to electrical engineering and have good experience in their trade covering work on h.v. and l.v. transmission and distribution, house wiring, wiring for motors and other equipment and the repair and overhaul of alternators, motors, etc.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting on letter M.29717B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (C 171)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

BRIGHTON "B" Power Station.—ASSISTANT ENGINEER (Mechanical Planning). Applicants who should possess sound technical knowledge and be familiar with the operation of H.P. plant will be responsible for the planning of mechanical maintenance and associated labour. Arrangements have been made with the Local Council whereby accommodation is available to those living at present in rented property. N.J.B. Conditions of Service, Class "J," Grade II, £639 per annum. Applications on forms obtainable from Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, should arrive by January 2, 1953. (C 181)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

JUNIOR COMMERCIAL ASSISTANT required in the Runcorn District of the Board's No. 2 Sub-area. Salary £473/£491 per annum (N.J.B. G/14). Applicants must have had engineering training and be in possession of the Ordinary National Certificate in Electrical Engineering, or equivalent.

The duties of the post will include estimating for contracting work and advising consumers on matters relating to electricity supply and appliances.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager (Ref. 93A), No. 2 Sub-area, Electricity House, Sandiway, near Northwich. Closing date: December 31, 1952. (C 172)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

SENIOR DEMONSTRATOR

APPLICATIONS are invited for this post from persons holding the Domestic Science Certificate and E. A. W. Diploma Certificate.

The successful applicant will require to supervise and train demonstrators and give public demonstrations, and also to have a good knowledge of electrical appliances. The position will entail travelling throughout the Board's extensive area.

Salary £520 x £20—£580 N.J.C. Grade 3, with placing according to experience. Superannuation Scheme applicable.

Application form obtainable from subscriber should be returned within ten days after the appearance of this notice.

W. D. D. FENTON,
Secretary.

16, Rothesay Terrace,
Edinburgh 3. (C 155)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Ayrshire Sub-Area

APPLICATIONS are invited for the following engineering appointments at Sub-Area Headquarters, Kilmarnock, both of which are superannuable.

Meters, testing, protection and communications.

SENIOR ASSISTANT ENGINEER.

Applications are invited from qualified engineers for the position of Senior Assistant Engineer at Sub-Area Headquarters, Kilmarnock.

Candidates should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications and should have wide knowledge and experience of:—

1. Metering practice, testing and repairs.
2. Testing of distribution equipment and fault location.
3. Modern protective systems.
4. Communications, supervisory and remote control systems.

Salary in accordance with N.J.B. Agreement, Schedule "A," Class "G," Grade 4—£905/£944 p. a.

Construction.

THIRD ASSISTANT ENGINEER.

Applications are invited for the position of Third Assistant Engineer (Construction) at Sub-Area Headquarters, Kilmarnock.

Applicants should be experienced in the construction of sub-stations, h.v. and l.v. overhead and underground mains and be Graduates of the I.E.E., or possess equivalent qualifications.

Salary in accordance with N.J.B. Agreement, Schedule "A," Class "G," Grade 10—£608/£630 per annum.

Forms of Application may be obtained from the undersigned or any other Sub-Area Manager and should be returned to me duly completed with any additional information not later than December 29, 1952.

A. E. ROOTS,
Manager.

Greenholm Street,
Kilmarnock.
December 10, 1952. (C 182)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SENIOR DRAUGHTSMEN are required in the mechanical engineering section of the Chief Generation Engineer's (Construction) Department at Wolverhampton. N.J.B. service conditions, superannuable appointments, salaries within Schedule "D," Grade 4, £671 to £780 and Grade 5, £567 to £671.

Experience in the layout and design of generating stations or generating plant, including boilers, turbo-alternators, and ancillary equipment required together with Higher National Certificate in mechanical engineering or equivalent qualifications.

Apply on forms available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham 13, to be returned by January 10, 1953.

F. W. LAWTON,
Divisional Controller.
(C 174)

LONDON ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER

APPLICATIONS are invited for the above position in the Sydenham District of the Southern Sub-Area.

The successful applicant will be required to assist the District Commercial Engineer with the commercial organisation and development of the district. Applicants should have practical experience in consumer service, commercial development of electricity supply (including experience in the operation of an electrical contracting and maintenance section), control of service centres, sales and staff (including experience in the administration and operation of hire and hire-purchase schemes).

Pending grading of the post under the national agreement of the appropriate negotiating body, the provisional salary will be £750 per annum inclusive.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned completed by December 27, 1952. Please enclose addressed foolscap envelope and quote ref: V/1538/T on all correspondence. (C 154)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, two ENGINEERING DRAUGHTSMEN in the Central Sub-Area of the Board at Cardiff.

Salaries in accordance with Schedule "D" Grade 6 (£433/£587) of the N.J.B. Agreement.

Applications, stating age, present position and salary, qualifications and experience and giving three referees to be addressed to the Secretary to arrive by December 30, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (C 170)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 822—SENIOR ASSISTANT ENGINEER (MECH.), No. 3 Sub-Division, Manchester. Salary £970 to £1,198 (N.J.B. AX/DX, Grade 1). Candidates should preferably hold an engineering degree or be members of the Institution of Mechanical Engineers, and must have had wide experience in the operation and maintenance of power station plant. Previous applicants for this position need not apply again.

Vacancy No. 839—SENIOR ASSISTANT ENGINEER (ELEC.), No. 2 Sub-Division, Kearsley, near Manchester. Salary, £970 to £1,198 (N.J.B. AX/DX, Grade 1). Candidates should preferably hold an engineering degree or be members of the Institution of Electrical Engineers, and should have had wide experience in the operation and maintenance of all power station electrical equipment.

Vacancy No. 840—STATION SUPERINTENDENT required for the new Generating Station at Roosecote, near Barrow, Lancs. (Ultimate capacity 120 MW.) Applicants should be fully qualified engineers with experience in the management of a large modern steam power station, preferably with P.F. fired boilers. An appreciation of modern concepts of administration, financial control, and employee relations including welfare, training and joint consultation, is desirable. Salary £1,158 to £1,299 (N.J.B., G 1).

Vacancy No. 841—ASSISTANT SHIFT CHARGE ENGINEER, Barton Generating Station. Salary, £680 to £706 (N.J.B., H.9).

Vacancy No. 844—STATION SHIFT CONTROL ENGINEER, Ribble Generating Station, Preston. Salary, £641 to £667 (N.J.B., H.10).

Vacancy No. 845—SHIFT CHARGE ENGINEER, Westwood Generating Station, Wigan. Salary, £729 to £758 (N.J.B., G.7).

Apply, quoting vacancy number, to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before December 27. (C 158)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Agreement.

THIRD ASSISTANT ENGINEER (ELECTRICAL)
Generation (Construction) Department—Divisional H.Q.

Qualifications: Experience in construction department of large electrical manufacturing organisation, or in the design and layout of generating station electrical plant and cables, is essential. Applicants should hold the Higher National Certificate or exempting diploma. Salary, Schedule C, Class "AX," Grade 5, within range £681 9s. to £829 10s. rising to timate maximumul Class "EX," £927 3s. p.a.

ASSISTANT ENGINEER (ELECTRICAL MAINTENANCE)
Lombard Road Generating Station

Qualifications: Experience in maintenance of e.h.t. and l.t. switchgear, rotary convertors, alternators, motor generators and motors. Ability to plan work to a strict schedule and experience in control of labour essential. Technical qualifications to Higher National Certificate standard preferred. Salary, Schedule A, Class "F," Grade 8, £866 15s. p.a.

Applications must be made on form obtainable from Divisional Secretary, B.E.A. London Division, Generation House, Great Portland Street, W.1, and be returned within 14 days of this advertisement. (C 186)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

ASSISTANT TO PURCHASING OFFICER

APPLICATIONS are invited for the post of Assistant to the Divisional Purchasing Officer at these Headquarters.

Applicants should have had experience of buying boiler house supplies, steam and water pipe fittings, valves, etc., general maintenance supplies and engineering equipment as required for generating stations and transmission sections, together with a sound knowledge of internal purchasing procedure, records, follow up and the organisation of stores.

The salary will be in accordance with Grade 3 of the National Joint Council Agreement (£520—£580 per annum).

The post will be pensionable within the provisions of the B.E.A. and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than December 30, 1952. Please quote Vacancy No. 107/52.

L. F. JEFFREY,
Divisional Controller.
(C 157)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (SALES SUPERINTENDENT)
—South District (Cheadle)

THE successful applicant will be required to assist the District Commercial Engineer in all normal sales activities. He will be responsible for supervising the organisation of service centres, exhibitions and publicity and the work of outdoor and indoor sales personnel.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

Salary scale: £697/£718 p.a., Grade F.7, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall Extension, Manchester 2, P.O. Box 439, by December 27, 1952.

APPOINTMENT OF SECOND ASSISTANT ENGINEER (Operation and Maintenance), Mains Department, Sub-Area Headquarters, Kendal.

Applicants should be experienced in operation and maintenance of all types of networks up to and including 33 kV.

Salary scale: £817/£852 p.a., Grade J.7, N.J.B. Conditions.

APPOINTMENT OF ASSISTANT (WAYLEAVES)
Barrow District.

Applicants must be experienced in negotiating wayleaves, the keeping of registers, and settlement of claims for damages arising out of the construction of supply lines.

Salary scale: £460/£520 p.a., N.J.C. Conditions.

Applications for the above posts to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by December 27, 1952. (C 183)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

SECOND ASSISTANT ENGINEER (SUBSTATIONS)
Transmission Department, Divisional Headquarters S/13.366

Candidates should have experience in the design, layout and installation of substations employing switchgear up to a working voltage of 275 kV and transformers up to 120 MVA capacity. Ability to negotiate and coordinate all technical and engineering matters associated with the installation of grid substations and to supervise site erection is essential. A knowledge of overhead line and underground cable work is necessary.

Applicants should be corporate members of a senior professional engineering institution or hold equivalent qualifications.

Salary, N.J.B. "AX/CX," Grade 2, £834 to £1,025.

GENERAL ASSISTANT ENGINEERS
Transmission Sections S/13.367

Applicants should have had experience in the operation and maintenance of a high voltage system and should have preferably received a works training on high voltage switchgear and transformers.

Candidates should be graduates of the I.E.E. or hold equivalent qualifications.

Salary, N.J.B. "AX/CX," Grade 8, £501 to £675.

Application forms, obtainable from P. D. A. Oliver, Esq., Divisional Secretary, 111 High Street, Portsmouth, must be returned by January 7, 1953. (C 185)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:

STATION SUPERINTENDENT
Southampton Generating Station. S/13.368

Applicants should have had a sound technical education, preferably be corporate members of a recognised professional institution, and have had a wide experience in the operation, maintenance and administration of a large generating station.

Salary N.J.B., Class "F1," £1,067—£1,134.

OPERATION SUPERINTENDENT
Poole Generating Station. S/13.364

The person appointed will be responsible for the efficiency of the generating station plant, the coaling programme and the operation of the coal and ash handling plant and disposal operations. Preference will be given to applicants who have had considerable experience in a large modern station with high temperatures and pressures and pulverised fuel equipment. A knowledge of the delivery of coal by sea will be an advantage. Applicants should preferably be corporate members of a senior professional Institution or hold equivalent qualifications.

Salary N.J.B. H/6, £833—£866.

Forms of application may be obtained from P. D. A. Oliver, Esq., Divisional Secretary, 111 High Street, Portsmouth and must be returned by December 31, 1952. (C 156)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions in the Division:—

ASSISTANT SHIFT CHARGE ENGINEER
Staythorpe, Nr. Newark. Vacancy No. 104/52

Applicants should possess the Higher National Certificate or its equivalent and have had experience in a responsible position in a modern generating station.

The salary will be in accordance with Class "J," Grade 9 (£719 to £750 p.a.) of the National Joint Board Agreement.

Closing date for the above appointment: December 29, 1952.

CIVIL ENGINEERING DRAUGHTSMEN
Construction Department, North Wilford.
Vacancy No. 106/52

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., or general building construction, drainage and sanitation schemes, associated with offices and administrative buildings.

The salary will be in accordance with Grade 5 (£567 to £671 p.a.) or Grade 6 (£433 to £567 p.a.), Schedule "D" of the National Joint Board Agreement, according to age and experience.

Closing date for the above appointment: January 5, 1953.

The above positions will be pensionable under the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity House, Barker Gate, Nottingham, and returned to the undersigned. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.
(C 187)

GOVERNMENT OF KUWAIT

QUALIFIED REFRIGERATION and Air-Conditioning ENGINEER required for the Government of Kuwait, Persian Gulf. Applicants to be men who have specialised in refrigeration and air-conditioning work, and have good knowledge of cold storage installations. They must also have had at least five years' experience in the design and operation of air-conditioning of large buildings and houses in countries where hot and dusty climatic conditions prevail. The Engineer will be required to organise and operate a refrigeration and air-conditioning department, and will be responsible for design, installation, operation, maintenance of refrigeration and air-conditioning schemes including the servicing of existing room coolers, both British and American. The consolidated salary will be from £2,000 to £2,500 per annum, depending on qualifications and experience. Free furnished accommodation, when available, will be provided also medical attention and air passage out and home. Applicants, stating age and giving full particulars of technical qualifications, practical training and subsequent experience, should be addressed in the first instance to the Secretary, Ewbank and Partners, Ltd., 10/11, Grosvenor Place, London, S.W.1. (C 127)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

JUNIOR ENGINEER is required at Walsall Generating Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Class "G," Grades 16 to 14, £390 to £473 per annum.

Applicants should preferably have had experience in a large generating station, and duties will consist mainly of switchboard operation. Ordinary National Certificate or an equivalent qualification an advantage.

Apply on forms available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13 to be returned by January 3, 1953.

F. W. LAWTON,
Divisional Controller.
(C 176)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS invited for following superannuable N.J.B. appointments:—

1. SHIFT CHARGE ENGINEER, Llynfi Power Station, near Aberkenfig. G.7 (£729 to £758).

2. ASSISTANT SHIFT CHARGE ENGINEER, Tir John Power Station, Swansea. H.9 (£680 to £706).

H.N.C. and regular apprenticeship desirable. Operating experience in a modern generating station essential.

Application forms obtainable from Div. Secretary, British Electricity Authority, South Wales Division, Cardiff (Pengam Moors) Airport, Cardiff, should be returned by December 31, 1952.

December 10, 1952. (C 159)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER required at Stoke Generating Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.7, commencing at £649 per annum.

Sound technical training and practical experience in the control and operation of steam generating plant and main switchgear, or mechanical and electrical experience in a manufacturer's works. Qualified marine engineers with electrical experience will receive consideration.

Apply on forms available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham 13, to be returned by January 3, 1953.

F. W. LAWTON,
Divisional Controller.
(C 175)

A LARGE mining company operating in Upper Burma, climate sub-tropical and healthy, has a vacancy for: ASSISTANT HYDRO-ELECTRICAL ENGINEER WITH MECHANICAL ENGINEERING EXPERIENCE. Good mechanical, electrical and switchboard experience essential. Salary Ks 850 (£63 15s. 0d.) monthly plus a cost-of-living allowance at present Ks 300 (£22 10s. 0d.) monthly. Four years' agreement. First-class passage out and home. Six months' leave on full basic salary at end of four years. Partly furnished quarters and medical attention free. Provident Fund.—Write: Box L.546, Willing's, 362, Grays Inn Road, London, W.C.1, with full details experience and references. (C 167)

APPLICATIONS are invited by the General Electric Co. Ltd., for the position of SHOWROOM ASSISTANT at the head office in Kingsway. It is essential for applicants to have had experience in a similar capacity, a knowledge of decorative fittings and not be more than 35 years of age. The position offers good prospects of promotion.—Apply in writing, giving full personal particulars, also of education and experience to the Staff Manager, Magnet House, Kingsway, London, W.C.2. (C 177)

APPOINTMENT IN CANADA for GENERAL MANAGER, Transformer Factory. Top executive required for proposed transformer factory in Canada, operating as subsidiary to established British Company. Applicants should be experienced in the design and production of power transformers up to 30 MVA, 88 kV, and also have ability to take over all the responsibilities of General Manager. Remuneration will start at a good level with excellent growth prospects as the company develops. Assistance given in housing.—Applications will be treated in confidence, and should be addressed to Box No. 2271, Electrical Times. (C 190)

ASSISTANT ELECTRICAL ENGINEER, South Wales; workshop experience; degree not essential.—Write Box No. 927, c/o Walter Judd Ltd., 47 Gresham Street, E.C.2. (C 188)

ASSISTANT MANAGER required for electrical contractor's office, Newcastle-on-Tyne, experience of estimating, job management and routine essential.—Application in writing, with details of experience, age and salary asked, to Drake and Gorham (Contractors) Ltd., 107, New Bridge Street, Newcastle. Envelopes marked "For the attention of Branch Manager." (C 115)

ASSISTANT POWER STATION SUPERINTENDENT required by large British company for Middle East. He must be under 40 and be capable of operating oil or gas-fired steam power station of three 18,750 kW turbo-alternators with six 120,000 lbs/hour 400 p.s.i. boilers and 11 kV switchgear. Should hold chartered qualification and have had 10 years' steam power station experience. Substantial allowances in addition to salary; pensionable posts; biennial paid home leave. Married man would have to face initial separation for possibly two years.—Write, quoting No. 307, to Box No. 6402, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (C 189)

B.B.C. requires ENGINEER in Planning and Installation Department, based in London. Permanent. Appointment on scale £590/£900. Duties consist chiefly of measuring of wiring installations for costing, agreeing quantities with contractors, checking accounts, conducting correspondence. Speed, accuracy, legible handwriting and good knowledge of accounts essential. Applicants should have served apprenticeship with reputable firm of electrical contractors, have wide experience in recognised methods of installing low and medium pressure wiring and cable work and be prepared to travel throughout UK.—Applications in own handwriting to Engineering Establishment Officer, Broadcasting House, London, W.1, within seven days. (C 169)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

A LEADING firm of consulting and contracting engineers invites applications for the following posts in London:—

(a) PIPING DESIGNER DRAUGHTSMEN with O.N.C. or H.N.C. (Mechanical) and experience of piping layout design in oil refinery or chemical plants.

(b) ELECTRICAL DESIGNER DRAUGHTSMEN with O.N.C. or H.N.C. or equivalent and experience on power and lighting distribution in refinery, chemical plant or associated fields.

These appointments carry sickness, pension and life assurance benefits and above average salaries are offered to capable men.—Applications should be addressed to:

Personnel Manager,
Kellogg International Corporation,
7/8 Chandos Street, London, W.1
(C 151p)

DOMESTIC COOKER DEMONSTRATOR required by British National Electrics, Ltd., for Northern England and Scottish areas. Applicants should preferably hold a Domestic Science Certificate and the E.A.W. Housecraft Certificate. Experience in the electrical industry is an advantage and applicants must be prepared to travel. Salary will be in accordance with training and experience.—Apply in writing, giving full details, to Employment and Welfare Manager, Johnson and Phillips, Ltd., Charlton, London, S.E.7. (C 192)

DRAUGHTSMAN, age 23 to 30, preferably with experience on transformers up to 11 kV and 2,000 kVA.—Write, stating age, experience and salary required, to Lindley Thompson Transformer Co., St. Mary's Road, Slough. (C 64)

DRAUGHTSMEN required for transformer drawing office. Previous experience of power distribution, radio or welding transformers is desirable. Progressive positions are offered to men with initiative in expanding department of large modern works on Merseyside. Housing assistance available for selected applicants.—Reply, giving details of age, experience and present occupation to Box No. 2227, Electrical Times (quoting Ref. AFA). (C 42)

DRAUGHTSMEN required with experience of light electro-mechanical devices for interesting new development and production drawing office work on domestic appliances and television receivers. Good opportunities for men with imagination and initiative in expanding department of large modern works on Merseyside. Housing assistance available for selected applicants.—Reply quoting Ref. AJEE to Box No. 2233, Electrical Times, giving details of age, experience and present occupation. (C 45)

ELECTRICAL CONTRACTS ENGINEER required by the English Electric Co., Ltd., Stafford, for handling orders for steel works, installations and other metal industries projects. Preference will be given to applicants between 25 and 35 years of age, who have minimum qualification of H.N.C. and previous contractual experience. Permanent and progressive positions.—Apply giving full details to Central Personnel Services, English Electric Co., Ltd., 336/7 Strand, London, W.C.2, quoting ref. 489D. (C 113)

ELECTRICAL ENGINEER required, familiar design and planning all types electrical installation and layouts; salary according to experience.—Apply, T. P. Bennett and Son, 43 Bloomsbury Square, W.C.1. Tel.: LANgham 6371. (C 125)

JOHNSON AND PHILLIPS LTD. require an experienced TESTER in their Transformer Department and Switchgear Department. Applicants should be thoroughly conversant with modern testing technique as applied to high-voltage transformers and industrial switchgear.

Applications, in writing, stating age, training, experience and salary required, should be addressed to Employment and Welfare Manager, Messrs. Johnson and Phillips Ltd., Charlton, S.E.7. (C 54)

JOHNSON AND PHILLIPS LTD. require two senior SWITCHGEAR DRAUGHTSMEN for SOUTH AFRICA. Candidates must have good practical and technical training in addition to experience with leading manufacturers, both in drawing and design offices, and preferably be between 30 and 40 years of age.

Applications, in writing, giving full particulars of training, experience, age and salary required to Employment and Welfare Manager, Johnson and Phillips Ltd., Victoria Works, Charlton, S.E.7. (C 82)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

POWER PLANT SHIFT CHARGE ENGINEERS REQUIRED

APPLICANTS should have served a recognised apprenticeship with a major engineering company and be able to produce evidence of a sound general and technical education. Experience of the following is desirable:—

(a) Work as a Shift Charge Engineer.
(b) High-pressure Boiler and turbine operation.
(c) Operational control of an interconnected h.t. industrial network.
(d) Other works auxiliary services.

The salary for this position, which is permanent and pensionable, will be not less than £700 per annum, and will be according to age and experience.

Apply in writing, to:—
The Personnel Superintendent,
The Steel Company of Wales Limited,
P.O. Box 3,
PORT TALBOT (C 179p)

JOHNSON AND PHILLIPS, LTD., require a SALES ENGINEER for south-west Scotland.—Applications in writing, stating age, training and experience, should be addressed to: The Manager, Johnson and Phillips, Ltd., 106 Hope St., Glasgow C.2. (C 193)

PLUMBER JOINTER required for London work, experienced in jointing paper insulated cables up to 11 kV.—Apply, in writing, stating age and experience, Electrical Installations, Ltd., 65 Vincent Square, Westminster, S.W.1. (C 163)

SHIFT CHARGE ENGINEER. Applications are invited for a large industrial power station, near London. Applicants should have had considerable experience in the operation of modern turbo-alternator plant and pulverised fuel fired boilers. Applicants to state age, experience and qualifications. Commencing salary £840. Non-contributory pension scheme.—Reply Box No. 2263, Electrical Times, quoting reference SCE. (C 137)

THE GENERAL ELECTRIC CO., LTD., have several vacancies for YOUNG ENGINEERS wishing to make their future careers in a Sales Organisation overseas. Applicants should be under thirty years of age and single, also possess an Electrical Engineering Degree or Higher National Certificate. An initial period of training in this country will be provided for the successful candidates.—Apply, in writing, giving full personal particulars, to the Staff Manager, Magnet House, Kingsway, London W.C.2. (C 162)

THE STARS AND STRIPES, an English language newspaper, in the U.S. Zone of Germany, has an immediate opening for an ELECTRICAL ENGINEER to assume responsibility of the power plant system, and supervise five (5) German electricians. Requirements: Practical knowledge and experience in low-voltage distribution, installation and maintenance; diesel-driven generators; underground cable distribution systems; standard installation practices, and ability to read blueprints and wiring diagrams of machines and equipment peculiar to the printing trade. A knowledge of the German language will be an asset. Single man preferred age 26-40.—Reply in confidence to The Stars and Stripes, A.P.O. 175, U.S. Army. (C 191)

TRACTION SUPERINTENDENT required by Crompton Parkinson, Ltd., Chelmsford, to take charge of the production of Railway, Trolleybus and Tramway Motors, Diesel Electrical equipment etc.—Applicants, who must have had extensive experience in this class of work should write, giving age, full details of training and experience to General Manager. (C 122)

WORK WANTED

A.C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (C 16)

ARMATURE REWINDING SERVICE to the Trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum Cleaner Armatures replaced from stock. 24-hour service. Every job guaranteed. All Vacuum Cleaner parts, hoses, etc., in stock for any make.—Regam Electric, 95-7 Park Lane, Leeds 1. (C 84)

CASTINGS. Fisher Foundries Ltd., Great, Birmingham, have capacity for brass, gunmetal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham. Victoria 0197. (C 21)

ELECTRIC motors, stators, etc., REPAIRED AND REWOUND. Vacuum cleaner and electric tools rewound. Seven-day service.—Motor Winding Co., 18 Gipsy Hill, London S.E.19 (Gipsy Hill 0354). (C 33)

METALWORK. All types cabinets, chassis, racks, etc to your own specifications.—Philpott's Metalworks Ltd., Chapman Street, Loughborough. (C 20)

PRESSINGS. Assemblies, wire work, spot and arc welding, capstan work. Quick service. Large quantities material available. Quotations by return. Specialists in sub-contract work.—Mountsorrel Pressings, 2, Loughborough Road, Mountsorrel. (C 130)

ZEROS REFRIGERATORS. Complete range of REPAIR AND SERVICE now available. Equipment reconditioned to pre-war manufacturers' specifications.—Time Engineers, Ltd., Refrigeration Specialists, Victory Road, Rainham, Essex (Rainham 4625), or Southern Area Agency (Tel.: Springpark 4217). Electrical spares supplied to the trade. (C 178)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete, change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (C 10)

ALTERNATOR required, 1,000 to 1,200 kW, 750 r.p.m., 3-phase, 50-cycle, salient pole for steam turbine drive. New or second-hand, preferably 6,600 V.—Offers, Box No. 2265, Electrical Times. (C 164)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (C 6)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady Street, Bethnal Green, E.1. (C 1)

WANTED, Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling.—Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (C 2)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London E.C.1. (C 8)

FOR SALE

CABLES & WIRE

LEAD CABLES. Several thousand yards unused 7/029, ref. 4132 and 4232, 7/036, ref. 4132, 7/044, ref. 4132, at £9, £10, £12 per 100 yds. respectively, carriage forward.—South Western Electricity Board, St. Petroc's, Bodmin, Cornwall. (C 160)

ENGINEERING PLANT & MATERIALS

CONDUIT ex-stock against Licence or S.Q.E. Certificate, close joint or welded, also CONDUIT FITTINGS, CABLE, etc.—Bertford Manufacturing and Supply Company, Marklands Works, Horwich, Lancs. Tel.: Bolton 6093. (C 35)

4 BA. by ¾ Cheesehead Steel Screws. 900 gross available.—Metropolitan Distribution, Ltd., Truro. (C 161)

750,000

NEW BALL RACES, ROLLER, THRUST AND TIMKEN RACES IN STOCK. STOCK LISTS AVAILABLE.

CLAUDE RYE BEARINGS

895-921 Fulham Road, London, S.W.6
RENown 6174 (20 lines) (C 27p)

GENERATING PLANT

AIRCRAFT Engine Driven Generators 24-V 1,500 and 1,000 W at 40/- each. Also cutouts and voltage regulators.—Wyllan Equipment Co., Wyllan House, 37-39, Houldsworth Street, Manchester 1. (C 180)

NEW HIGGS 6 KVA ALTERNATORS 230/1/50, 1,500 r.p.m., with shunt regulators. Available immediately. A few other outputs available at 415/3/50 up to 70 kVA at 1,000 r.p.m.—Box No. 2267, Electrical Times. (C 165)

ONE complete 394 kW BRUSH ALTERNATING SET with overhung exciter supplying 440 V, 3 phase, 50 cycles. Direct coupled to a Petter Superscavenge Diesel engine, 540 b.h.p. at 600 r.p.m. Set complete with oil fuel tanks and piping, separate compressed-air starting set, cooler, switchgear, panels and spares.—Box No. 2269, Electrical Times. (C 166)

STEAM-DRIVEN GENERATING PLANT.

500 kW, 625 kVA Steam Set comprising vert., encl., compound two crank Steam Engine by Browett Lindley; cylinders 23 x 32½- x 15-in. stroke, 165 lb/sq in., 15 lb back pressure. Direct driven alternator by L.D.C., 440/3/50, 333 r.p.m., with exciter and switchgear.

250 kW Steam Engine-driven Generator Set, 400 V d.c., 3-wire, 625 amp, 375 r.p.m. with 365 b.h.p. Belliss and Morcom engine. Steam pressure 180/195 lb/sq in., exhausting to 60 lb back pressure, with oil-free exhaust. Cylinders 11- x 11- x 9-in.

250 kW Steam-driven Generator Set, 400 V d.c., 3-wire, 625 amp, 375 r.p.m.; direct driven by 365 h.p. Belliss and, Morcom compound Steam Engine No. 6203; steam 180 lb/sq in., exhausting to 26 in. vacuum and subject to valve setting could be modified for 160 lb/sq in., and back pressure up to 10/20 lb. At present installed with surface condenser by Belliss and Morcom, with circulating pump and Edwards extraction pump.

1,000 kW Turbo-Alternator Set by Westinghouse; 400/440/3/50; steam pressure 200 lb/sq in., 3,000 r.p.m., exhausting to surface condenser.

Three Babcock and Wilcox Boilers, each approx. 25,000 lb evap. 200 lb pressure, for saturated steam, with economisers, chain grate stokers, two boiler feed pumps Hopkinson fittings.

George Cohen Sons and Co., Ltd., Wood Lane, London, W.12. Tel.: Shepherds Bush 2070 and Stanningley, near Leeds. Tel.: Pudsey 2241. (C 110)

25 kVA TANGYE ALT. SET, 400 V, 3-ph., 50 c/s, on common bedplate. 30 kVA Altg. Set, Bruce Peebles, 500/550 V, 3-ph. with exciter mounted on common bedplate.—Chamberlain Industries, Ltd., Staffa Road, Leyton, E.10 (Ley. 6636). (C 133)

LIGHTING EQUIPMENT

FLUORESCENT FITTINGS complete with all control gear. Finished hard gloss white stove enamel. Fully guaranteed two years. 5 ft Hexagon Batten S.B.5, 57s. 6d. 5 ft Industrial Trough T.M.5, 63s., 4 ft Slim Batten C.H.4, 48s. 6d. Also 2 ft and 3 ft. All prices ex works. Illustrated catalogue and price list on request.—M.E.S., Ltd., 117 Hornsey Road, N.7. NORth 4923. (C 60)

PURLEY CHOKES AND BALLASTS. Our 80 W tapped h.p.f. ballast, with starter switchgear-holder incorporated, is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each, subject.—F. W. Blanshard Ltd. (Dept. ET), Purley, Surrey. Uplands 4818-9. (C 17)

METERS

A.C./D.C. QUARTERLY and SLOT METERS. Brent Electrical Co., 6 Holmdale Gardens, London, N.W.4. (C 7)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 12)

MOTORS & STARTERS

A.A. ELECTRICAL CO. FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Chiswick 5605, 67 Rothschild Road, W.4. (C 9)

A. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22. (Forest Hill 2278-9.) (C 4)

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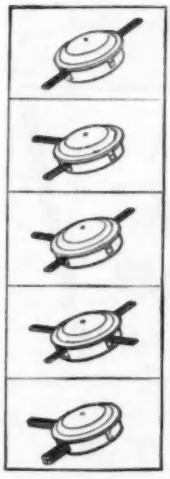

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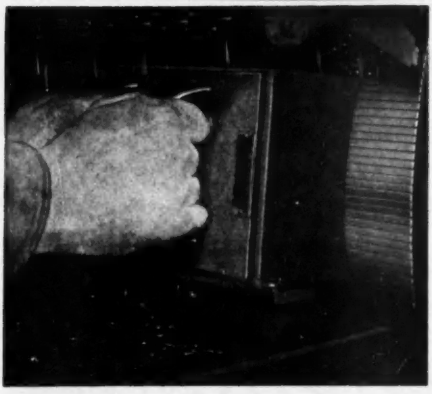

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150	960	Brook	S. Protected	Slip Ring
145	290	Westinghouse	O. Protected	Slip Ring
125	960	Brook	S. Protected	Slip Ring
120	720	Brook	S. Protected	Slip Ring
110	580	Brook	S. Protected	Slip Ring
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40	480	Bruce Peebles	Totally Enc.	Slip Ring
40	720	Brook	S. Protected	Slip Ring
35	580	E.E.C.	S. Protected	Slip Ring
30	960	B.T.H.	S. Protected	Slip Ring
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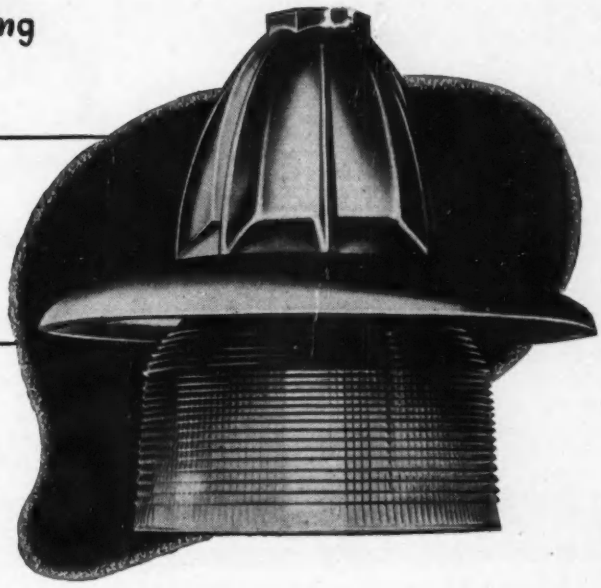

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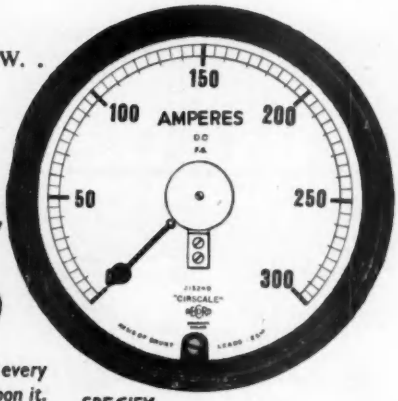

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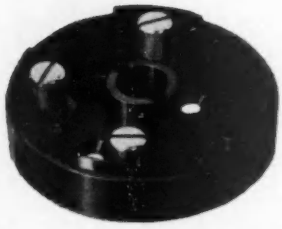

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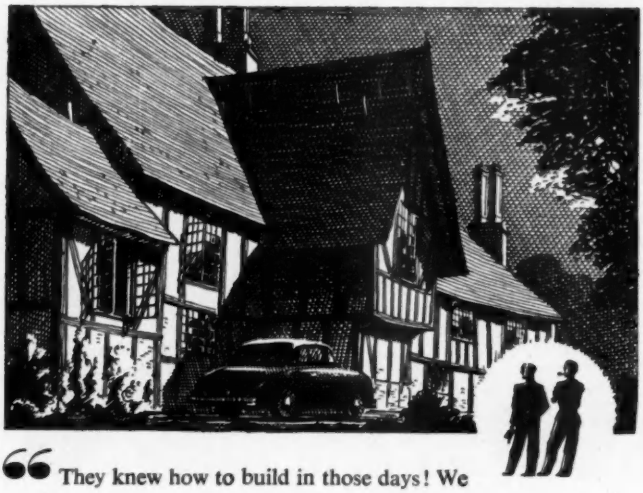

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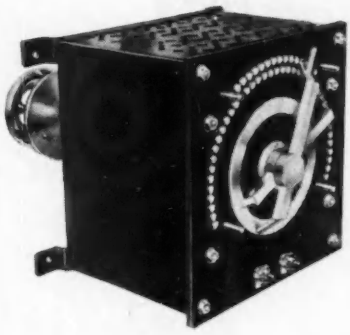

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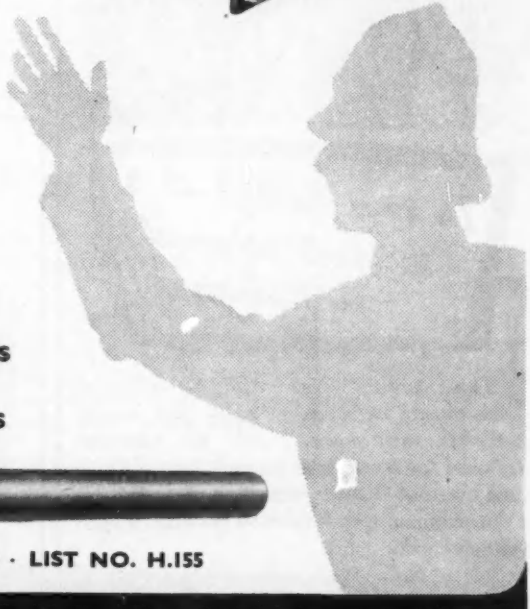

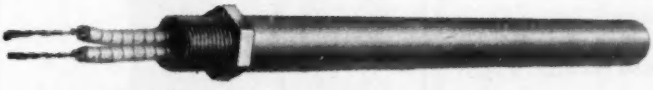

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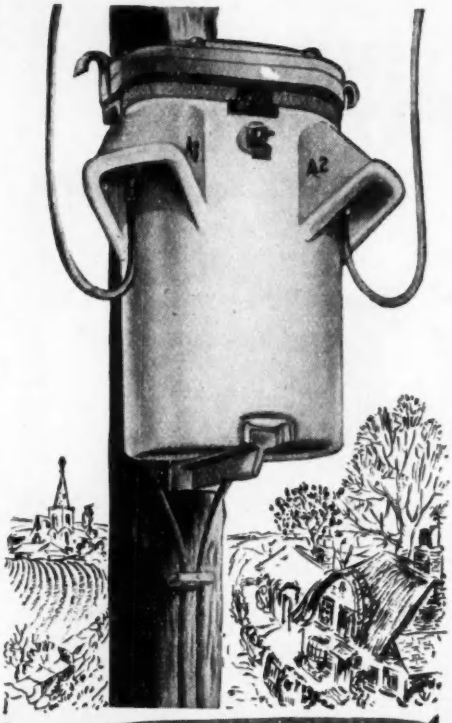

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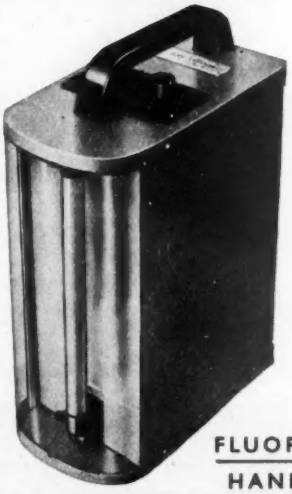

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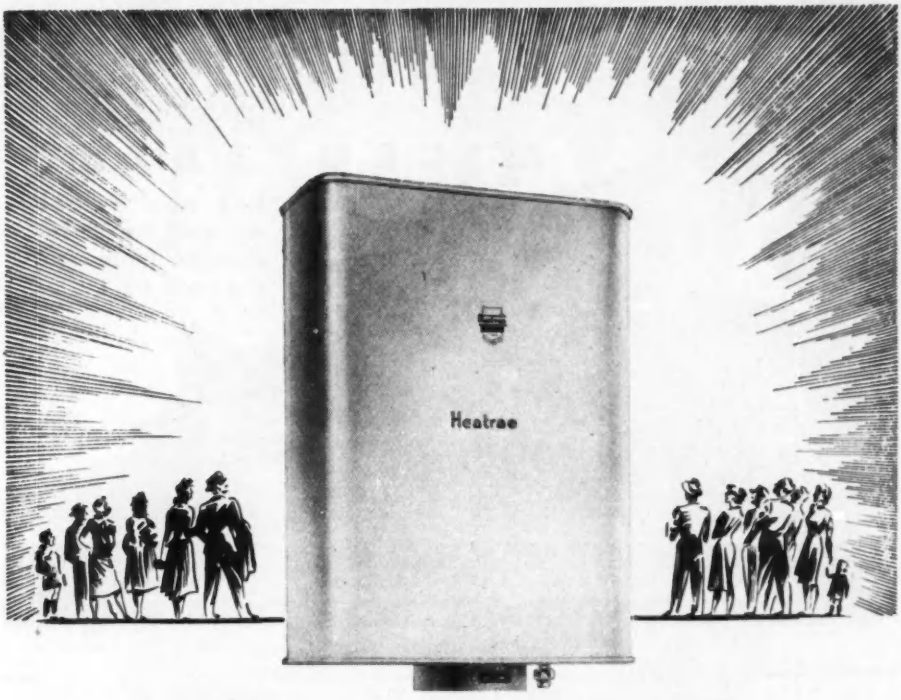

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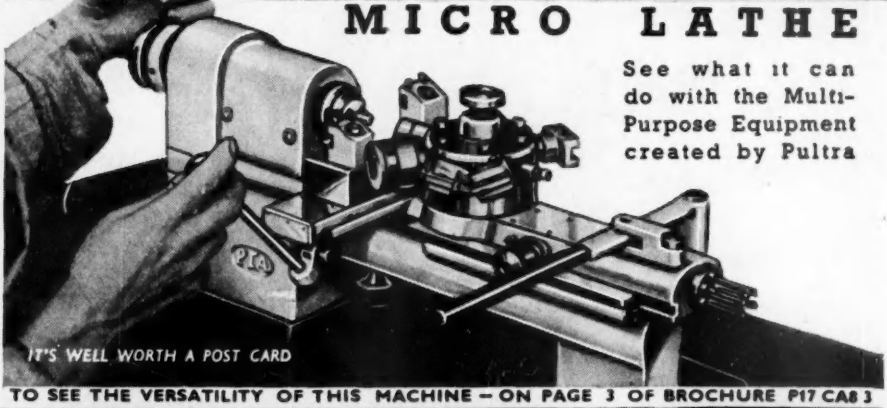

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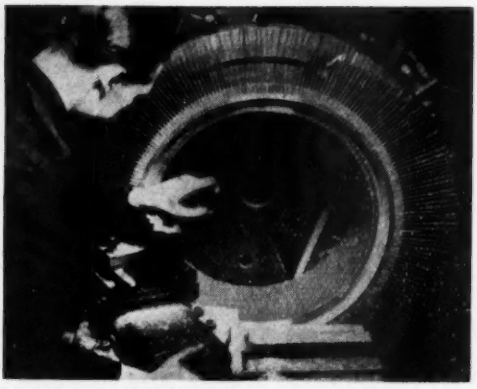

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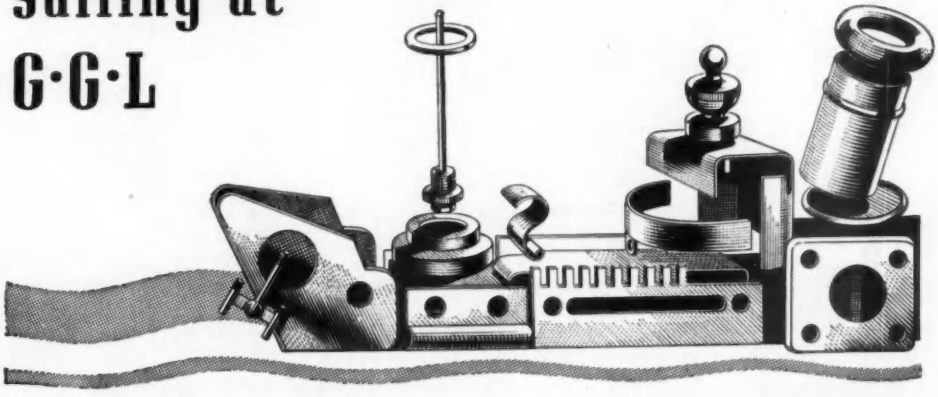

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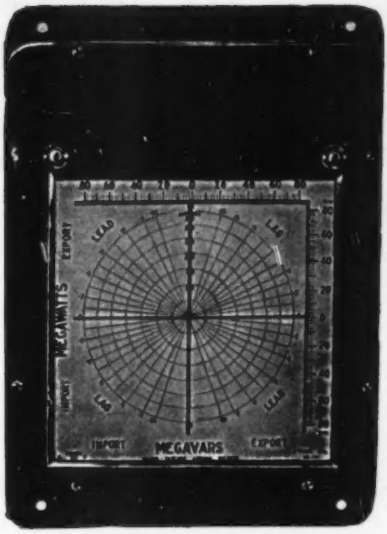

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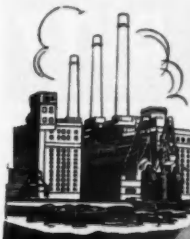

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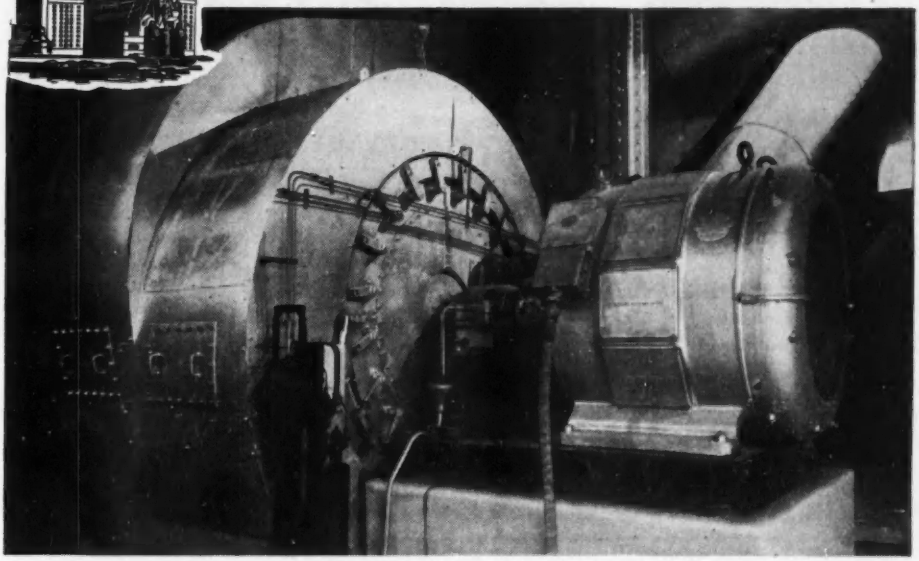

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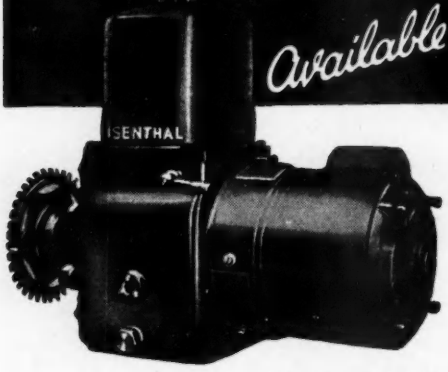

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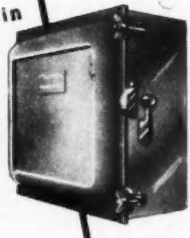

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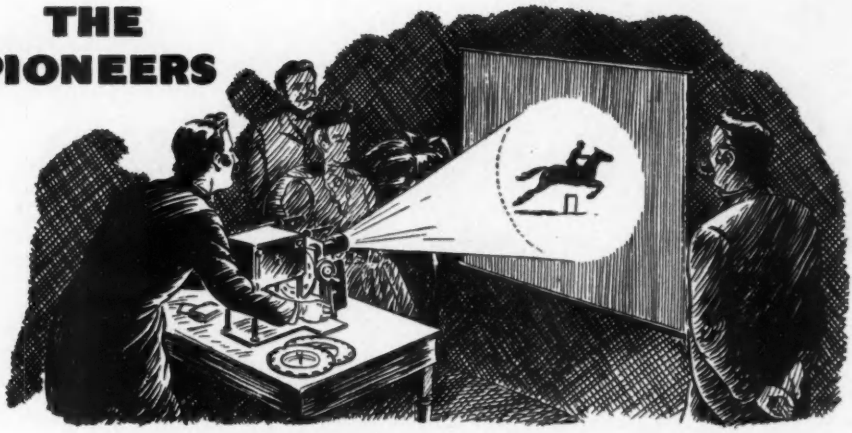

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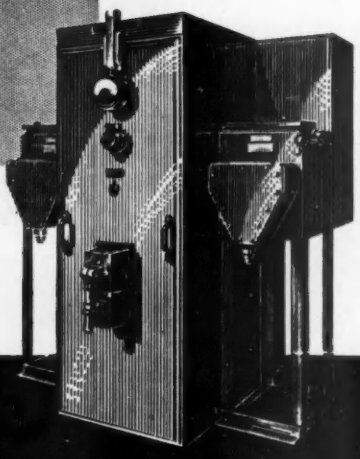

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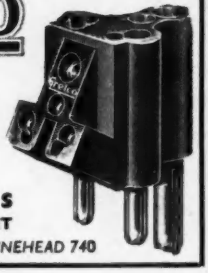

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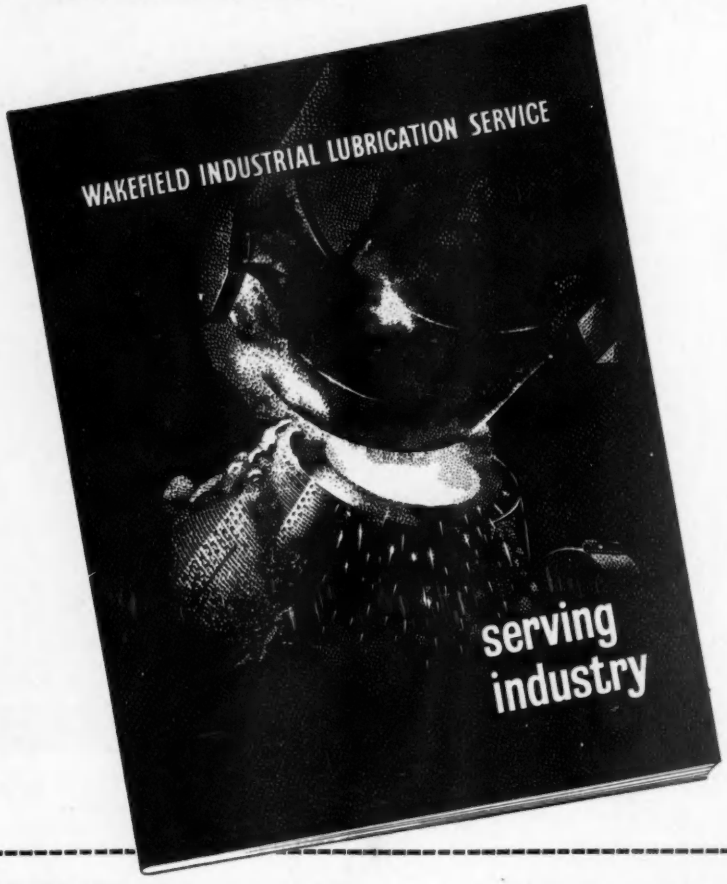

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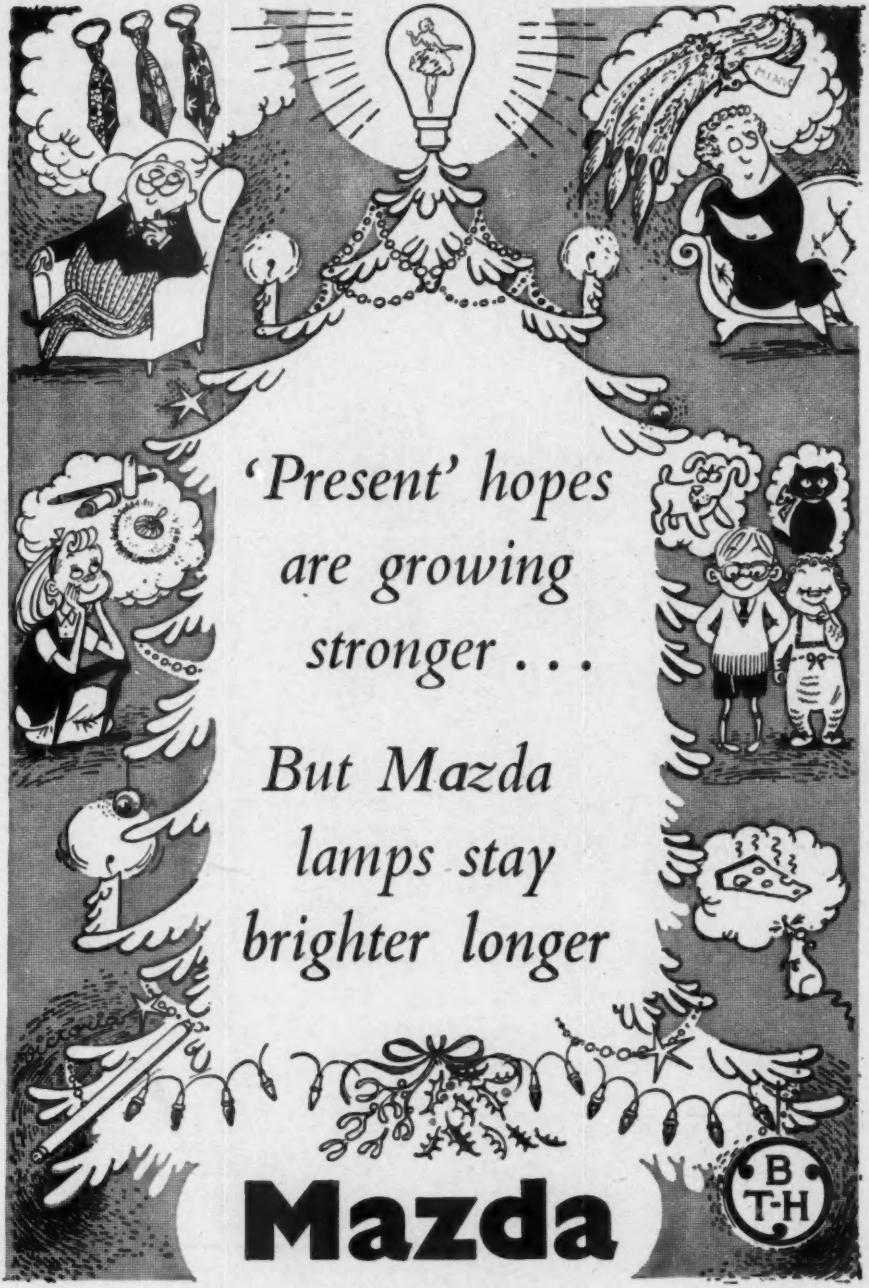

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